# APPENDIX N

## Supplemental Information for Compliance with MEPA

*Note:*

Appendix N consists of the entire Appendix I of the Final EIS of August 26, 2011. An electronic version of Appendix I is provided here for the reader's convenience. Therefore, the page, table, and figure numbering, and references to attachments and appendices are to those within this Appendix, or to the Final EIS of August 26, 2011, sometimes referred to as the "main EIS" or "the EIS" in the text of this appendix.

This appendix has the following general organization:

## Supplemental Information for Compliance with MEPA

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## Attachments

1. MDEQ Environmental Specifications for the Proposed Keystone XL Project

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# I-1.0 INTRODUCTION

As described in Section 1.0 of this U.S. Department of State (DOS) environmental impact statement (EIS), TransCanada Keystone Pipeline, L.P. (Keystone) has applied to the Montana Department of Environmental Quality (MDEQ) for a Certificate of Compliance under the Major Facility Siting Act (MFSA) for the proposed construction, operation, and maintenance of the Montana portion of the Keystone XL Project (proposed Project), a 36-inch-diameter crude oil pipeline and associated facilities. Pursuant to 75-20-301 Montana Code Annotated (MCA), before MDEQ can approve the proposed Project as proposed or an alternative, MDEQ must find and determine:

> "(1)(a) the basis of the need for the facility;
>
> (b) the nature of the probable environmental impact;
>
> (c) that the facility minimizes adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives;
>
> (d) in the case of an electric, gas, or liquid transmission line or aqueduct:
>
> (i) what part, if any, of the line or aqueduct will be located underground;
>
> (ii) that the facility is consistent with regional plans for expansion of the appropriate grid of the utility systems serving the state and interconnected utility systems; and
>
> (iii) that the facility will serve the interests of utility system economy and reliability;
>
> (e) that the location of the facility as proposed conforms to applicable state and local laws and regulations, except that the department may refuse to apply any local law or regulation if it finds that, as applied to the proposed facility, the law or regulation is unreasonably restrictive in view of the existing technology, of factors of cost or economics, or of the needs of consumers, whether located inside or outside the directly affected government subdivisions;
>
> (f) that the facility will serve the public interest, convenience, and necessity;
>
> (g) that the department or board has issued any necessary air or water quality decision, opinion, order, certification, or permit as required by 75-20-216(3); and
>
> (h) that the use of public lands for location of the facility was evaluated and public lands were selected whenever their use is as economically practicable as the use of private lands.
>
> (2) In determining that the facility will serve the public interest, convenience, and necessity under subsection (1)(f), the department shall consider:
>
> (a) the items listed in subsections (1)(a) and (1)(b);
>
> (b) the benefits to the applicant and the state resulting from the proposed facility;
>
> (c) the effects of the economic activity resulting from the proposed facility;
>
> (d) the effects of the proposed facility on the public health, welfare, and safety;
>
> (e) any other factors that it considers relevant."

This appendix[1] provides supplemental information needed to support the findings that must be made by MDEQ before the proposed Project could be approved in Montana under MFSA. Without this approval, Keystone would not be able to construct the pipeline in Montana. Further, without the approval of MDEQ, Keystone would not be able to exercise the right of eminent domain in Montana, and there is no federal eminent domain authority for crude oil pipelines.

MDEQ has determined that issuance of a Certificate of Compliance under MFSA may result in a significant adverse impact to the environment as defined by the Montana Environmental Policy Act (MEPA). This appendix provides the environmental analyses required by MEPA to supplement the environmental assessments presented in the main body of the EIS, which was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA). The analyses in this appendix focus upon environmental concerns in the vicinity of the proposed Project route, alternative routes, Montana route variations, and Keystone route realignments in Montana.

MEPA requires that MDEQ provide a detailed statement about the following:

- The environmental impact of the proposed Project in Montana;
- Any adverse environmental effects that could not be avoided if the proposal was implemented;
- Alternatives to the proposed Project, including a meaningful analysis of the No Action Alternative;
- Any regulatory impacts on the private property rights of the applicant;
- The relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity;
- Any irreversible and irretrievable commitments of resources that would be involved in the proposed Project if it was implemented; and
- The details of the beneficial aspects of the proposed Project, both short term and long term, and the economic advantages and disadvantages of the proposal.

The proposed Project would transport Western Canadian Sedimentary Basin (WCSB) crude oil from an oil supply hub near Hardisty, Alberta, Canada to destinations in the south central U.S., including an existing oil terminal in Cushing, Oklahoma and existing delivery points in the Port Arthur and east Houston areas of Texas. In total, the proposed Project would consist of approximately 1,711 miles of new 36-inch-diameter pipeline, with approximately 327 miles in Canada and 1,384 miles in the U.S. In Canada, the proposed pipeline would be adjacent to an existing pipeline along much of the route, including at the proposed border crossing near the Port of Morgan, Montana.[2] Most of the alternative routes analyzed in the EIS begin at that border crossing.

The proposed Project would initially have a nominal transport capacity of 700,000 barrels per day (bpd) of crude oil. By increasing the pumping capacity in the future, the proposed Project could ultimately transport up to 830,000 bpd of crude oil through the proposed pipeline. Additional information about the proposed Project is presented in Sections 1.1 and 2.0 of the main body of the EIS.

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[1] References to other appendices are to appendices in the main EIS. References to attachments are to the attachments to this Appendix I.

[2] On March 11, 2010, the National Energy Board (NEB) of Canada announced that it had issued a Certificate of Public Convenience and Necessity for the Project in Canada. The NEB Reasons for Decision, including Certificate Conditions and the Environmental Screening Report are presented in Appendix R.

As defined in the EIS, the proposed Project would consist of three new pipeline segments plus additional pumping capacity on the previously constructed Cushing Extension Segment of the existing Keystone Oil Pipeline project (Cushing Extension; see Section 1.1 of the EIS, Figure 1.1-1). The three proposed new pipeline segments in the U.S. would consist of the following:

- Steele City Segment − from the U.S./Canada border, crossing between Saskatchewan and Montana near the Port of Morgan, Montana (where the pipeline of the Canadian portion of the proposed Project terminates), to the northern end of the existing Cushing Extension at Steele City, Nebraska;
- Gulf Coast Segment − from the southern end of the Cushing Extension in Cushing, Oklahoma, to the existing crude oil delivery point in the Petroleum Administration for Defense District (PADD) III at Nederland, Texas; and
- Houston Lateral − from the Gulf Coast Segment in Liberty County, Texas, to a new delivery point near Moore Junction (Harris County), Texas.

As proposed, the new pipeline would extend through five states: Montana, South Dakota, Nebraska, Oklahoma, and Texas. The existing Cushing Extension traverses southern Nebraska, Kansas, and northern Oklahoma.

MDEQ assisted DOS as a cooperating agency during preparation of the EIS for the proposed Project. As a result of its involvement in the EIS process, MDEQ will use the DOS EIS, including the Montana-specific information presented in this appendix, to comply with MEPA and MFSA.

Information presented in the main body of the EIS addresses the topics listed below that are also required under MEPA and MFSA. The sections of the EIS where the major topics are addressed are noted in parentheses:

- Executive Summary (Executive Summary);
- Purpose and Need (Section 1.2);
- Alternatives to the Proposed Action (Section 4.0, including the No Action Alternative);
- Description of the proposed Project (including construction methods − Section 2.0);
- Potential Environmental Impacts (including direct, indirect [secondary], cumulative impacts, and mitigation measures − Section 3.0);
- Permitting Requirements (Section 1.8);
- Public and Agency Coordination (Sections 1.3 through 1.7);
- Potential Releases during Construction and Operation and Environmental Consequence Analysis (Section 3.13);
- List of Preparers (Appendix X);
- List of Abbreviations and Acronyms (Table of Contents); and
- References Cited (presented at the end of each section of the EIS).

This appendix provides the supplemental information required to fully comply with MEPA and MFSA in the following sections:

- Analysis of Alternatives in Montana (Section I-2.0);
- Environmental Analysis of the Proposed Keystone XL Project in Montana (supplemental to information in the EIS regarding the nature of environmental impacts, as required by MFSA, and residual impacts remaining after the application of mitigating measures; Section I-3.0);
- Unavoidable Adverse Impacts (Section I-4.0);
- Irreversible and Irretrievable Commitments of Resources (Section I-5.0);
- Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity (Section I-6.0); and
- Regulatory Restrictions (Section I-7.0).

Information regarding the proposed Project and potential alternatives (i.e., design, location, schedule, workforce, and other details needed to conduct an environmental assessment of the proposed Project and alternatives) was obtained from Keystone's application for a Presidential Permit and associated submittals to DOS, Keystone's application for a MFSA Certificate of Compliance and subsequent field studies and submittals associated with the application, Keystone's proposed Plan of Development for a right-of-way (ROW) grant from the U.S. Bureau of Land Management (BLM), and limited field work undertaken by MDEQ staff. Information about the existing environment in Montana that was included in the documents submitted by Keystone was partially reviewed for accuracy by MDEQ, and the documents were reviewed for accuracy by the third-party environmental contractor to DOS and MDEQ. Where appropriate, information from those documents was used in this appendix. Information about existing conditions and potential environmental impacts associated with implementation of the proposed Project was also obtained from literature searches and field studies conducted by the third-party environmental contractor, sources of information publicly available in Montana, and knowledge of the area in the vicinity of the routes of the proposed Project and the alternatives and variations to and the realignments of the proposed route.

## I-2.0 ANALYSIS OF ALTERNATIVES

This section describes the development and analysis of proposed Project alternatives, and proposed route variations and potential realignments to Keystone's proposed route (Alternative SCS-B) in Montana in the following subsections:

- Background (Section I-2.1);
- No Action Alternative (Section I-2.2);
- Major Alternative Routes in Montana (Section I-2.3)
- Route Variations and Keystone Realignments (Section I-2.4);
- Preferred Route in Montana (Section I-2.5); and
- References Cited (Section I-2.6).

### I-2.1 BACKGROUND

Section 4.0 of the EIS presents an analysis of alternatives to the proposed Project. The analysis was conducted in accordance with the requirements of NEPA, which has requirements that are essentially the same as those of MEPA. The alternatives analysis presented in the EIS was revised based upon comments on the draft and supplemental draft EIS and updated information or information unavailable at the times the draft and supplemental draft EIS were issued. This information included the recent EnSys Energy and Systems, Inc. report (EnSys 2010) about the need for the proposed Project and the relationship of the proposed Project to production of crude oil from the Canadian oil sands. The U.S. Department of Energy (DOE) Office of Policy & International Affairs contracted with EnSys to evaluate WSCB crude oil transportation scenarios through 2030. DOE conducted the study to assist DOS in better understanding the potential impacts of the presence or absence of the proposed Project on U.S. refining and petroleum imports, international markets, and production of crude oil from the WCSB. The EnSys (2010) report is presented Appendix V.

The conclusions reached in the revised assessment of alternatives remain the same as those presented in the EIS.

The alternatives analysis included a screening process that first considered a range of categories of potential alternatives. The categories of alternatives considered included:

- No Action Alternative (Section 4.1) − addresses projected beneficial and adverse environmental, social, and economic impacts that would result if the proposed Project were not implemented;
- System Alternatives (Section 4.2) − the use of other pipeline systems or other methods of providing heavy crude oil to the Cushing tank farm (PADD II) and the U.S. Gulf Coast market (PADD III);
- Major Route Alternatives and Route Variations (Section 4.3) − other potential pipeline routes for transporting heavy crude oil from the U.S./Canada border to the Cushing tank farm (PADD II) and the U.S. Gulf Coast Market (PADD III), and minor route adjustments along the proposed Project route;
- Alternative Pipeline Designs (Section 4.4) − aboveground installation of the pipeline and alternate pipeline diameters; and

- Alternative Sites for Aboveground Facilities (Section 4.5) − alternative sites for pump stations, mainline valves (MLVs), and the tank farm.

The No Action Alternative considered a variety of potential scenarios that would occur if the proposed Project was not implemented. The screening process for all other categories identified potential alternatives based upon the following evaluation criteria:

- The alternative must be technically and economically practicable;
- The alternative must meet the purpose of and need for the proposed Project; and
- The alternative must offer a substantial environmental advantage over the comparable proposed Project element.

As described in Section 4.1 of the EIS, DOS eliminated the No Action Alternative from further consideration for the following primary reasons:

- Implementation of the No Action Alternative would not meet the purpose of and need for the proposed Project;
- Implementation of the No Action Alternative would not meet the demand for heavy crude oil in PADD III, even with implementation of the "low demand" scenario for transportation identified by EPA and the use of alternative energy sources and energy conservation, because those scenarios would have only a minor effect on the heavy crude oil needs of PADD III[3] refineries;
- Implementation of the No Action Alternative would likely result in impacts that would be similar to those of the proposed Project due to the construction and operation of other projects to meet the heavy crude oil needs of PADD III refineries;
- Implementation of the No Action Alternative would not affect future production in the Canadian oil sands unless no other pipelines were constructed, west through Canada or south through Canada and the U.S., to transport WCSB crude oil to markets in the U.S. or other countries;
- Implementation of the No Action Alternative would not affect total life-cycle greenhouse gas (GHG) emissions of crude oil production and use because the oil would continue to be produced and shipped elsewhere; and
- Implementation of the No Action Alternative would not provide a relatively stable and secure source of North American crude oil and reduce U.S. dependence on less reliable foreign oil supplies.

MEPA requires that MDEQ analyze the No Action Alternative. That analysis is provided in Section I-2.2 of this appendix.

In Section 4.2 of the EIS, the system alternatives considered were eliminated from further consideration because the alternative modes considered would be less safe, would require construction of infrastructure that would be similar to that of the proposed Project, have greater atmospheric emissions (including GHG), and/or pose greater safety hazards than the proposed Project.

Major alternative routes and route variations were considered in Section 4.3 of the EIS using the screening process described in Section 4.3.2. The screening process was designed to determine whether

[3] PADD III (Gulf Coast) consists of the states of Alabama, Mississippi, Louisiana, Arkansas, Texas, and New Mexico.

the alternatives identified should be eliminated from further consideration or should be evaluated in greater detail. Most alternative routes were required to connect to several fixed locations (control points) to meet the proposed Project's purpose and need. The control points placed constraints on potential geographic alternatives to achieve the proposed Project's purpose and need. The Steele City Segment, which would extend through Montana, had the following two control points:

- Control Point 1: the U.S./Canada border crossing between Saskatchewan and Montana near the town of Morgan, Montana, where the pipeline of the Canadian portion of the proposed Project would terminate – that control point would be the northern end of the Steele City Segment; and
- Control Point 2: the northern end of the existing Cushing Extension of the existing Keystone Oil Pipeline project near Steele City, Nebraska – that control point would be the southern end of the Steele City Segment).

In Section 4.3 of the EIS, seven alternative routes were identified and compared to the proposed Project route for the Steele City Segment and one additional alternative that would extend from the U.S./Canada border to the Cushing tank farm and that would not include Control Point 2 at the northern end of the Cushing Extension (i.e., would not be a Steele City Segment alternative). Two of the Steele City Segment alternative routes identified were not considered reasonable alternatives and were eliminated from further consideration and none of the remaining five Steele City Segment alternatives assessed in Section 4.3 of the EIS offered a significant environmental advantage or a safety advantage over the proposed route, and were therefore eliminated from further consideration.

The following information is summarized for Montana from the complete analysis of alternatives presented in Section 4 of the EIS. See Section 4 of the EIS for the complete analysis.

### I-2.2 NO ACTION ALTERNATIVE

MDEQ would select the No Action Alternative if it could not make the findings required for issuance of a Certificate of Compliance under MFSA. Under the No Action Alternative, MDEQ would not issue a Certificate of Compliance to Keystone, and the proposed Project would not be constructed and operated in Montana.

With selection of the No Action Alternative, the beneficial and adverse environmental, social, and economic impacts associated with the proposed Project in Montana (discussed in Section 3.0 of the EIS and in Section I-3.0 of this appendix) would not occur. While this alternative would eliminate the environmental impacts specific to the proposed Project, it would not meet Keystone's objectives. As stated in Section 1.2.1 of the EIS, the primary purpose of the proposed Project is to transport crude oil from the WCSB to delivery points in PADD III to meet the growing demand by refineries and markets in PADD III. It could also offset the decreasing domestic crude oil supply and reduce U.S. dependence on less reliable foreign oil sources.

U.S. demand for petroleum products would likely continue to increase for the foreseeable future. The Energy Information Administration (EIA) estimated that the total U.S. consumption of liquid fuels, including fossil liquids and biofuels, would increase from the 19.5 million bpd consumed in 2008 to 22.1 million bpd in 2035 in the AEO2010 reference case (EIA 2010). For the total U.S. demand, biofuels consumption would account for most of the growth, because consumption of petroleum-based liquids is projected to be essentially flat across the country. However, in PADD III, consumption of heavy crude is expected to increase as production of lighter crude from current sources decreases (EnSys 2010). The increase in heavy crude consumption coupled with continued expected declines from Mexican and Venezuelan sources of heavy crude make increased access to Canadian crude desirable from both an economic and national security standpoint. Further, limited pipeline capacity constrains the supply of WCSB crude oil reaching PADD III (Canadian Association of Petroleum Producers 2009, Purvin & Gertz 2009, EnSys 2010), which represents the largest refining capacity in the U.S. The proposed Project would have a nominal initial capacity to deliver up to 700,000 bpd of crude oil to delivery points in PADD III near the Gulf Coast refineries. If market demand were to increase in the future, the maximum capacity of the proposed Project could be increased to approximately 830,000 bpd by increasing pumping capacity along the route.

The No Action Alternative would not provide the U.S. with a relatively stable and secure source of North American crude oil for the PADD III market via a new pipeline through Montana. In addition, the U.S. dependence on less reliable foreign oil supplies from the Mideast, Africa, Mexico, and South America would remain at its current level or increase further unless alternative methods of delivery or alternative pipeline routes were developed to transport crude oil to PADD III. Alternative transportation methods and pipeline routes are discussed in Sections 4.2 and 4.3 of the EIS.

The forecasted demand for crude oil in the U.S., including in PADD III, is expected to continue, even with concentrated efforts to develop renewable energy resources and promote energy conservation (EIA 2010, EnSys 2010). As a result, other oil transportation projects could be developed if the proposed Project were not constructed and operated. Over the long term, despite current economic concerns, worldwide demand for crude oil from the WCSB oil sands would continue to increase. Alternative transportation systems to move this oil to markets in the U.S. or elsewhere, such as China or Japan, could emerge if the proposed Project were not constructed (EnSys 2010). Although it would be speculative to predict the environmental impacts of those actions, selection of the No Action Alternative would not necessarily result in less impact.

In addition, the No Action Alternative could result in more expensive and less reliable crude oil supplies for the Gulf Coast refineries, particularly heavy crude oil supplies. This would increase the costs of delivered heavy crude oil and could decrease the availability of the refined products for end-users.

## I-2.3 MAJOR ALTERNATIVE ROUTES IN MONTANA

The following sections describe the methods that were used to develop major pipeline route alternatives, including analyses of the alternatives that were carried forward for evaluation, as well as those that were considered and eliminated from further evaluation.

### I-2.3.1 DEVELOPMENT OF ALTERNATIVE ROUTES IN MONTANA

MFSA regulations require MDEQ to identify the alternative that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land. In addition to the route alternatives assessed in Section 4.3 of the EIS and in the initial Keystone MFSA application (see Section I-2.3.4), MDEQ required that Keystone provide assessments of two additional routes using a route development model based upon geographic information system (GIS) databases (i.e., ground surveys were not conducted) that incorporated a set of weighted environmental factors, including both preferred attributes and less desirable attributes (described below). With that approach, the model-generated routes could be further evaluated and compared to the proposed Project route relative to environmental impacts, the use of public lands, and costs.

The model-generated routes used the following control points:

- U.S./Canada Border near the Port of Morgan, Montana to an interconnection with Alternative SCS-A in Williams County, North Dakota;

- U.S./Canada Border near the Port of Morgan to the Missouri River; and
- Missouri River to an interconnection with an alternative in South Dakota.

The model-generated route segments between the control points had to meet both the key criteria used to develop alternatives for the DOS EIS, including avoiding or minimizing use of, to the extent practical, key areas of concern, and any additional avoidance factors identified by MDEQ. For the alternative development process for the main body of the EIS, the following were the primary areas to be avoided or used minimally:

- Crossings of large waterbodies and water control structures;
- Rugged terrain that could impact constructability;
- Crossings of large wetland complexes;
- Highly developed urban areas and urban infrastructure;
- Properties listed on the National Register of Historic Places;
- Wildlife refuges and management areas;
- Key waterfowl use or nesting areas;
- Irrigated croplands;
- Forested areas, including commercial forest lands; and
- Close approaches to residences and outbuildings.

In developing the GIS model alternatives, Keystone, after consultation with MDEQ, used a “fatal flaw” approach that included the criteria listed in MFSA and in MFSA Circular 2. These criteria included use of preferred, excluded, and avoidance areas that were weighted in the GIS model.

The following were in the “preferred areas” category of the GIS model:

- Public lands;
- Existing utility and/or transportation corridors (use of or parallel to);
- Logged areas rather than undisturbed forest, in timbered areas;
- Geologically stable areas;
- Non-erosive soils in flat or gently rolling terrain;
- Roaded areas where existing roads could be used for access to the facility during construction and operations and maintenance;
- Areas where the facility would create the least visual impact;
- Alignments that were a safe distance from residences and other areas of human concentration;
- Lands which could be returned to their original condition through re-contouring; and
- Areas that enhanced conservation of topsoil and reclamation.

The following were in the “excluded areas” category in the GIS model:

- National wilderness areas;

- National primitive areas;
- National wildlife refuges and ranges;
- State wildlife management areas;
- Wildlife habitat protection areas;
- National parks and monuments;
- State parks;
- National recreation areas;
- Corridors of rivers in the national wild and scenic rivers system and rivers eligible for inclusion in the system;
- Roadless areas of 5,000 acres or greater in size and managed by federal or state agencies to retain the roadless character;
- Rugged topography (defined as areas with slopes greater than 30 percent);
- Specially managed buffer areas surrounding national wilderness areas and national primitive areas;
- Active faults;
- Large waterbodies;
- Residences;
- Domestic wells; and
- Oil and gas wells.

The following were in the “areas to be avoided” category of the GIS model:

- Wetlands and streams;
- Habitat of listed threatened or endangered species or that of species that are candidates for listing; and
- Irrigated farmland.

The model also included other sensitive areas typically avoided during route refinement, including the following:

- Known paleontological sites;
- Wellhead protection areas and aquifers;
- Known locations of cultural resources; and
- High Consequence Areas, as designated by the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS).

The overall constructability of the pipeline and associated facilities was also considered, as was the desire to minimize impacts of the proposed Project while considering costs and optimizing the use of public land. A more detailed description of the methods used in developing the GIS alternatives is included in Keystone’s alternatives assessment report submitted to MDEQ; that document (*Keystone XL Steele City*

*U.S. Segment, Montana Route Alternatives Analysis Report; August 2009*) is incorporated into this EIS by reference.

The extent, shape, and prevalence of many resources (e.g., rivers, historic trails, wetlands, and farmlands) preclude completely avoiding impacts to them for any route within the Steele City Segment. In developing the GIS route alternatives, consideration was given to routes that would have all or part of their lengths parallel to existing linear facility ROWs (i.e., routes that overlap, are directly adjacent to, or are within 150 feet of an existing ROW). Siting a new pipeline parallel to an existing ROW is often considered because concentrating linear developments in or near other existing linear corridors could reduce the impacts to certain resources, such as sage-grouse habitat, that already had been disturbed by major linear projects. However, such paralleling also could concentrate impacts on a few private landowners.

Installing the pipeline within existing ROWs could reduce the amount of new disturbance. However, the owner of an existing ROW may not allow the proposed construction ROW to overlap with an existing pipeline ROW. This could result in two separate but parallel disturbances. In other cases it could be advantageous to select a new pathway that made better use of public land, if the number of miles of new construction that could be required was economically practicable and impacts to environmental and cultural resources were not substantially greater than those of the proposed route.

The GIS modeling identified the following two alternatives:

- Canada to South Dakota Alternative (CSD), which initially consisted of two route segments − the Canada to Missouri River (CMR) segment and the Missouri River to South Dakota (MRSD) segment − based upon the control points identified above; and
- Canada to North Dakota Alternative (CND).

Figure I-2.3-1 depicts these two alternatives along with the other alternatives assessed in Montana. The two segments of Alternative CSD would cross the Missouri River at the same locations. As a result, Keystone combined the two segments in its MFSA application to compare the alternative with the proposed route. In the analyses presented below, the two segments are addressed separately, where appropriate, and are also considered as a single alternative, Alternative CSD, for the purposes of comparing the alternative to the proposed route in Montana and in the Steele City Segment of the proposed Project.

The Alternative CSD route would cross the Missouri River at about the same location as the proposed route and would extend along the same route as the proposed Project for approximately 22.9 miles. The southern end of Alternative CSD would connect to the proposed route in southern Harding County, South Dakota.

Alternative CND would end in western Williams County, North Dakota, where it would join the route of Alternative SCS-A, which would extend to the Cushing Extension. Starting in Roosevelt County, Montana, the Alternative CND route would be in close proximity and essentially parallel to Alternative SCS-A. Because of that close proximity and the scale of Figure I-2.3-1, the Alternative CND route would appear to connect to the route of Alternative SCS-A in Roosevelt County. However, Alternative CND would extend across the Montana/North Dakota border and join the Alternative SCS-A route in western Williams County, North Dakota.

## I-2.3.2 ANALYSIS OF MONTANA ROUTE ALTERNATIVES

As discussed in Section I-2.1, an initial screening process was used to identify potential major route alternatives for transporting heavy crude oil from two U.S./Canada border crossings in Montana to the Cushing tank farm (PADD II) and the U.S. Gulf Coast Market (PADD III). This process resulted in development of the 10 alternatives listed below and depicted in Figure I-2.3-1 for consideration in Montana:

- Express-Platte Alternative 1 and Express-Platte Alternative 2 would parallel the existing Express-Platte Pipeline System through central Montana, Wyoming, and Nebraska;
- Alternatives SCS-A1A, SCS-A, and CND would extend through northeastern Montana, North Dakota, South Dakota, and Nebraska;
- Keystone Corridor Alternative 1 would extend to the east from Morgan to the existing Keystone Pipeline and parallel to that ROW to the Cushing Extension;
- The proposed route (Alternative SCS-B) would traverse eastern Montana, South Dakota, and Nebraska;
- The Baker Alternative would traverse southeast Montana, southwest North Dakota, and northwest South Dakota;
- The Western Alternative would parallel the Express-Platte Pipeline System into Wyoming, divert from the Express-Platte route, and then extend to the Gulf Coast Segment without using the existing Cushing Extension; and
- The CSD Alternative that is generally parallel to the proposed route (Alternative SCS-B).

The analysis of alternative routes was conducted in several phases, as described in Section 4.3.2. After identifying potential route alternatives that were economically and technically practicable, the assessment considered overall feasibility in relation to the purpose of and need for the proposed Project (as described in Section 1.2 of the EIS) and major environmental issues. This initial review resulted in the elimination of some alternatives, as described in Section I-2.3.3 (Alternatives Initially Considered and Eliminated). Alternatives selected for further analysis were reviewed, as described in Section I-2.3.4(Comparison of Retained Alternatives).

## I-2.3.3 ALTERNATIVES INITIALLY CONSIDERED AND ELIMINATED

After reviewing the 10 alternatives listed above, seven of those alternatives were eliminated from further evaluation as summarized below. Sections 4.3.3 and 4.3.4 of the EIS present additional information about those alternatives.

### I-2.3.3.1 Express-Platte Alternatives

The Express-Platte Pipeline System is a 1,700-mile-long oil transportation network that connects Canadian and U.S. producers to refineries in the Rocky Mountain and Midwest regions of the United States. The system consists of two crude oil pipelines – the Express Pipeline and the Platte Pipeline. The Express Pipeline extends from Hardisty to markets in Montana, Wyoming, Utah, and Colorado. It crosses the U.S./Canada border near the Port of Wild Horse, Montana, and connects to the Platte Pipeline system at Casper, Wyoming. The Platte system extends from Casper to Wood River, Illinois.

### Express-Platte Alternative 1

The border crossing of the Express-Platte Pipeline System is substantially west of the proposed Project's border crossing near the Port of Morgan. As described in Section 4.3.3.1 of the EIS, the Express-Platte Alternative 1 for the Steele City Segment would be approximately 234 miles longer than the proposed route, have a greater area of impact, affect more areas of key resources, and would have almost three times as much federal land as the proposed route. It also would extend over more land underlain by the Northern Plains High Aquifer (NHPAQ) system in Nebraska.

Keystone has obtained the necessary permits to construct the proposed Project in Canada, which terminates north of the U.S./Canada border near Morgan. Implementation of Express-Platte Alternative 1 would require submitting a new permit application to the NEB for a revised route in Canada, and the approval process would not be completed in a time frame that would meet the proposed Project objectives. For these reasons, Express-Platte Alternative 1 was not considered reasonable and it was therefore eliminated from further consideration.

### Express-Platte Alternative 2

Express-Platte Alternative 2 was developed to provide an alternative route that would start at the control point near Morgan while still paralleling the existing pipeline system over much of its length. It would not require a new route in Canada. This alternative would be approximately 198 miles longer than the proposed Project route, and would affect about 2,700 more acres when considering the 110-foot-wide construction ROW, extra work spaces, additional contractor and pipe yards, and additional access roads over that distance. In addition, it would cross the Antelope Creek Wilderness Study Area from mileposts 112.7 to 114.9. It would also affect almost four times as much federal land as the proposed route, including a crossing of the Antelope Creek Wilderness Study Area, and would extend over more of the NHPAQ system than the proposed Project route. For those and other reasons described in Section 4.3.3.1, Express-Platte Alternative 2 would not offer a significant environmental advantage over the proposed route and was therefore eliminated from further consideration.

### I-2.3.3.2 Alternatives SCS-A and SCS-A1A

In its initial application to MDEQ, Keystone identified two alternatives that would connect with the existing Keystone Pipeline in North Dakota; from there the alternatives would parallel the Keystone Pipeline to Steele City. Alternative SCS-A would parallel the Northern Border Pipeline and would cross through the Fort Peck Indian Reservation. Keystone developed a second alternative (Alternative SCS-A1A) that would extend north of the reservation in Montana. Although the alternate routes would parallel the Northern Border Pipeline, they would not meet the preferred location criteria listed in Circular MFSA-2, particularly the use of public lands, including state lands. Alternative SCS-A would be 69.0 miles longer than the proposed route for the Steele City Segment, and Alternative SCS-A1A would be about 100.6 miles longer than the proposed route along the Steele City Segment. These alternatives would be considerably longer and the overall impacts of each route for the entire Steele City Segment were considered to be greater than those of Keystone's proposed route. For these and other reasons presented in Sections 4.3.3.2 and 4.3.3.3 of the EIS, neither Alternative SCS-A or Alternative SCS-A1A would offer a significant environmental advantage over the proposed Project route and both alternatives were eliminated from further consideration.

### I-2.3.3.3 Keystone Corridor Alternative 1

Keystone Corridor Alternative 1 would begin at the Morgan control point, extend approximately 442 miles eastward into eastern North Dakota, and then extend southward about 640 miles paralleling the existing Keystone Pipeline ROW to the control point at the northern end of the Cushing Extension. This alternative route was developed to avoid major national wildlife refuges and several smaller refuges that are present near the northern border of North Dakota. The route would also avoid crossing the Turtle Mountain Indian Reservation.

This alternative would be approximately 230 miles longer than the proposed route and would affect at least 3,200 more acres during construction when including the 110-foot-wide construction ROW, extra work space areas, additional pipe and construction yards, and additional access roads. It would affect less rangeland and grassland than the proposed route and would cross nearly 60 percent less federal land than the proposed route. However, it would affect substantially more streams and rivers, more agricultural land, developed land, forested land, and wetlands, and would cross more National Park Service land than the proposed Project route.

In addition, groundwater information reflected by well depth data, well density data, and hydraulic conductivity data (where available) suggest that there is no overall environmental advantage to Keystone Corridor Alternative 1 in terms of cumulative risk to groundwater resources.

For these and other reasons described in Section 4.3.3.4 of the EIS, Keystone Corridor Alternative 1 would not offer a significant environmental advantage over the proposed Project route and was eliminated from further consideration.

### I-2.3.3.4 Baker Alternative

The Baker Alternative was developed at MDEQ's request to parallel an existing pipeline, use a greater proportion of public land, and be shorter than the proposed Project route. The Baker Alternative would deviate from the proposed Project route in Fallon County and would extend for approximately 62.1 miles parallel to an existing pipeline ROW into Bowman County in southwest North Dakota. The alternative would return to the ROW of the proposed Project in Harding County, South Dakota. The Baker Alternative would be approximately 2.4 miles shorter than the segment of the proposed Project route that it would replace.

This alternative would cross an active oil and gas field along the Cedar Creek Anticline. While the alternative would avoid the wells themselves, the route would cross many gathering pipelines. Construction through that area would increase the risk of accidental damage and a resultant gas leak or oil spill. Keystone estimated that the cost to construct this alternative would be approximately $3.25 million greater than that of the proposed route because of the additional time needed to construct through the existing gathering pipelines. Further, if a leak or spill were to occur due to damage to one of these gathering lines, Keystone would incur additional environmental and cleanup costs.

The initial segment of the Baker Alternative would extend below Lake Baker or would be in its watershed. There is a popular, developed recreation site at the edge of Baker that is one of only a few such sites in the region. Construction could disrupt access to recreation in the short term in this area. Over the long term, the risk associated with an oil spill was considered to be unacceptably high, despite a very low statistical probability of a leak.

This alternative would cross substantially less agricultural land and less forested land and wetlands than the comparable segment of the proposed route. However, it would also cross more developed areas, rangeland and grassland, and streams and rivers than the proposed route; would affect a substantially larger area of BLM land; and would also cross approximately 22 more miles of core sage-grouse habitat than the proposed Project route.

For these and other reasons described in Section 4.3.3.6 of the EIS, the Baker Alternative would not offer a significant environmental advantage over the segment of the proposed route it would replace and was eliminated from further consideration.

#### I-2.3.3.5 Western Alternative (Alternative to both the Steele City Segment and the Cushing Extension)

The Western Alternative would be a substitute for both the Steele City Segment and the Cushing Extension. This approximately 1,277-mile-long alternative would enter the U.S. at Morgan and extend through Montana, Wyoming, Colorado, Kansas, and Oklahoma to the control point at the southern end of the Cushing Extension.

Although the Western Alternative would parallel the existing Express-Platte System corridor for approximately 350 miles, the existing easements along that corridor are in the control of a different company and it may not be possible to construct the alternative pipeline within the existing ROW. Therefore, construction of the alternative may result in the same impacts as construction of a pipeline of similar length that is not parallel and adjacent to an existing ROW.

The Western Alternative would be approximately 426 miles longer than the proposed route and would affect about 6,000 more acres (more than 9 square miles) than the proposed route, including the 110-foot-wide construction ROW, extra work space areas, additional pipe and construction yards, and additional access roads. The Western Alternative would affect substantially more agricultural land, developed land, forested land, rangeland and grassland, and wetlands than the proposed route. It would also cross substantially more streams, rivers, and federal land than the proposed route. The Western Alternative would avoid crossing the NHPAQ system and the Sand Hills topographic region of Nebraska. The route would also avoid crossing the Charles M. Russell National Wildlife Refuge, the Medicine Bow National Forest, and the Pawnee National Grassland.

The Western Alternative is not considered a reasonable alternative to the proposed Project due to the financial impracticability of constructing a pipeline that would be substantially longer than the proposed route. In addition, the Western Alternative would not offer an overall environmental advantage over the proposed route. Therefore, this alternative was eliminated from further consideration.

### I-2.3.4 COMPARISONS OF RETAINED ALTERNATIVES

The remaining three alternatives (Alternative CND, Alternative CSD, and the proposed Project route [Alternative SCS-B]) were analyzed further, as described in this section. The comparisons include length of the alternatives (Section I-2.3.4.1), potential impacts to key resources (Section I-2.3.4.2), and estimated construction costs (Section I-2.3.4.3).

Keystone did not include consideration of the preferred Montana routing criteria and preference for the use of public land in selecting Alternative SCS-B as its proposed route. The MFSA application noted that state school trust lands and other public lands had specifically been avoided, which was not in compliance with MFSA and MEPA requirements. Thus, MDEQ worked with Keystone and the third-party EIS contractor to develop two new alternatives (Alternatives CND and CSD) in a manner that provided clear documentation of the steps taken and factors considered, as indicated in Sections I-2.1 and I-2.3.

MFSA, in part, requires that MDEQ find and determine that a proposed facility minimizes adverse environmental impacts, considering the state of available technology and the nature and economics of the various alternatives, before the facility is approved. This finding does not prohibit MDEQ from considering costs and impacts outside of Montana. Thus, in the following sections, Alternatives CND and CSD are compared to the proposed Project route in Montana and also for the entire Steele City Segment (i.e., from the Montana-Saskatchewan border to Steele City, Nebraska), where appropriate. For this phase of the analysis of alternatives, overall length of the pipeline was considered (Section I-2.4.2.1), as were potential impacts to key environmental resources (Section I-2.3.4.2) and construction costs (Section I-2.3.4.3). Section I-2.3.4.4 presents conclusions to the analysis of the retained alternatives.

### I-2.3.4.1 Lengths of the Alternatives

In general, longer alternative routes affect a greater area of land than shorter routes. However, if the 110-foot-wide construction ROW were to overlap an existing pipeline's operating ROW, the amount of new disturbance might be reduced. Without overlap, each mile of an alternative route would typically impact approximately 13.3 acres during construction and 6.0 acres during operation without including the area required for extra work space areas, additional pipe and construction yards, and access roads. As a result, there usually are environmental advantages to keeping the length of pipe required to reach the control point as short as possible while considering impacts to natural, cultural, and other environmental resources. However, a shorter route may not optimize the use of public lands as required by MFSA.

Table I-2.3-1 lists the distances of each of the Montana alternatives assessed from the Montana-Saskatchewan border near the Port of Morgan to Steele City, along with the distance in Montana.

**TABLE I-2.3-1**
**Lengths and Construction Areas of Alternatives**

| Alternative | Length In Montana (miles) | Estimated Construction Area In Montana (Acres) | Length of Steele City Segment (miles)[1] | Estimated Construction Area of Steele City Segment (Acres)[1] |
|---|---|---|---|---|
| Canada to North Dakota (CND) | 185.4 | 2,472.0 | 924.7 | 12,329.3 |
| Proposed Route (SCS-B) | 282.7 | 3,769.3 | 851.6 | 11,354.7 |
| Canada to South Dakota (CSD)[2] | 290.5 | 3,873.3 | 859.2 | 11,456.0 |

[1] The Steele City Segment extends from the Montana-Saskatchewan border near the Port of Morgan, Montana to Steele City, Nebraska.

[2] Consists of the Canada to Missouri River (CMR) segment and the Missouri River to South Dakota (MRSD) segment.

As noted in Table I-2.3-1, implementation of the proposed route for the Steele City Segment would result in the shortest pipeline distance of the three alternatives and would therefore result in less total construction impacts than the other alternatives; however, it would not optimize the use of public lands. Alternative CND would be the shortest route through Montana, but it would be the longest Steele City Segment route of the three alternatives.

### I-2.3.4.2 Potential Impacts

For the second phase of analysis of the alternatives, the potential impacts to three key resources were considered:

- Major Stream Crossings;
- Land Uses; and
- Use of Publicly Owned Lands.

## Major Stream Crossings

Table I-2.3-2 lists the number of perennial and intermittent streams crossed in Montana by each alternative. Alternative CND would cross 50 fewer major streams than the proposed Project route and 44 fewer major streams than Alternative CSD in Montana. However, the route of the entire Steele City Segment, from the Port of Morgan, Montana to Cushing, Oklahoma, with Alternative CND has 118 more major stream crossings than Keystone's proposed Steele City segment. Alternative CSD would cross 11 fewer intermittent streams than the proposed Project route in Montana, but 5 more perennial streams. Based upon this level of analysis, Alternative CND would offer an environmental advantage for stream crossings over both Alternative CSD and the proposed route in Montana. Alternative CSD and the proposed route are expected to have similar overall impacts to stream crossings in Montana.

**TABLE I-2.3-2**
**Major Stream Crossings by Alternatives in Montana[1]**

| Alternative | Segment | Number and Type of Crossings | | |
|---|---|---|---|---|
| | | Intermittent Streams | Perennial Streams | Total Major Streams |
| Proposed Route (SCS-B) | Canada to Missouri River | 34 | 7 | 41 |
| Canada to South Dakota (CSD) | Canada to Missouri River (CMR) | 32 | 7 | 39 |
| Proposed Route (SCS-B) | Missouri River to South Dakota Border Segment | 83 | 8 | 91 |
| CSD | Missouri River to South Dakota (MRSD) Border | 74 | 13 | 87 |
| Canada to North Dakota (CND) | Entire Route | 72 | 10 | 82 |
| CSD | Entire Route | 106 | 20 | 126 |
| Proposed Route (SCS-B) | Entire Route | 117 | 15 | 132 |

[1] Perennial and intermittent streams from ESRI 2004.

## Land Use

No cities or towns would be directly crossed by the alternatives because all alternatives would extend through sparsely populated areas. The counties that would be crossed by the alternatives had population densities that ranged from about 0.5 to 4.4 people per square mile. Although Alternative CSD would cross approximately 0.8 mile on the west side of the St. Marie Census Designated Place[4], that area is also sparsely populated (about 8 people per square mile). Therefore, the impact to populated areas is not a discriminator in the assessment of alternatives.

Table I-2.3-3 lists the major types of land uses crossed by each alternative. Most of the land crossed by the three alternatives considered would be range land or fallow land. The proposed route would cross about 274.6 miles of those lands, compared to 282.2 miles for Alternative CSD and 182.4 miles for Alternative CND. Because these types of land use could generally continue as currently practiced after

[4] A Census Designated Place is an unincorporated area without a separate municipal government that has been established exclusively for census purposes.

reclamation and revegetation was implemented, there would not be a substantial difference in impacts to those land uses among the alternatives considered.

In Montana, Alternative CSD would affect about 0.2 mile more developed land and 2.5 miles more forest/woodlands than the proposed Project route. However, Alternative CSD would extend through about 1.4 fewer miles of wetlands than the proposed route. Alternative CND would not cross forest/woodlands, whereas the proposed route would cross about 0.7 mile of forest/woodlands. Alternative CND would cross about 0.4 mile less wetlands than the proposed route, but 3.5 miles more developed land. Overall, Alternatives CSD and CND would not appear to offer an environmental advantage for land use over the proposed route.

**TABLE I-2.3-3**
**Land Uses Crossed by Alternatives in Montana**

| Land Use Type[1] | Land Use Crossed (Miles) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Proposed Route − Canada to Missouri River Segment | Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment | Proposed Route − Missouri River to South Dakota Segment | CSD − Missouri River to South Dakota (MRSD) Segment | Canada to North Dakota (CND) | CSD (Entire Route) | Proposed Route |
| **Land Cover[1]** | | | | | | | |
| Wetlands | 1.0 | 0.6 | 1.7 | 0.7 | 2.3 | 1.3 | 2.7 |
| Forest/Woodlands | 0.1 | 0.0 | 0.6 | 3.2 | 0.0 | 3.2 | 0.7 |
| Developed | 0.9 | 2.0 | 2.5 | 1.6 | 6.9 | 3.6 | 3.4 |
| **Combined Land Unit Classification[2]** | | | | | | | |
| Fallow Land | 22.6 | 20.3 | 57.2 | 26.6 | 96.5 | 46.9 | 79.8 |
| Range Land | 64.2 | 70.9 | 130.6 | 164.4 | 85.9 | 235.3 | 194.8 |
| Hay Land | 0.1 | 0.0 | 4.6 | 5.8 | 2.9 | 5.8 | 4.7 |
| Irrigated Land | 2.1 | 2.2 | 1.0 | 0.0 | 0.1 | 2.2 | 3.1 |
| Non-Commercial Forest Land | 0.1 | 0.1 | 0.2 | 0.2 | 0.0 | 0.3 | 0.3 |
| **Total** | 89.1 | 93.5 | 193.6 | 197.0 | 185.4 | 290.5 | 282.7 |

[1] Based on United States Geological Survey (USGS) 2001.
[2] Based on Montana Department of Revenue and Montana Department of Administration 2010.

## Public Lands

Table I-2.3-4 summarizes the ownership of public land for the alternatives considered in Montana. As noted in Section I-2.3.1, MDEQ included state and federal lands in the "preferred area" category. This preference was due to the requirement to conform to criteria listed in Section 75-20-301, MCA. However, in developing Alternative SCS-B (the proposed route), Keystone elected to avoid public land to the extent feasible. Most federal lands in Montana are managed by BLM, and the majority of federal lands crossed by each alternative are managed by BLM. BLM typically would prefer an alternative that used less BLM land, if all other environmental factors were roughly equivalent and the proposed Project purpose and need were met.

| TABLE I-2.3-4<br>Public Land Crossed by the Alternatives in Montana | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Miles of Public Land Crossed | | | | | | |
| Agency with Jurisdiction[1] | Proposed Route − Canada to Missouri River Segment | Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment | Proposed Route − Missouri River to South Dakota Segment | CSD − Missouri River to South Dakota (MRSD) Segment | Canada to North Dakota (CND) | CSD − Entire Route | Proposed Route in Montana |
| U.S. Bureau of Land Management | 22.2 | 34.6 | 21.6 | 77.7 | 70.1 | 112.3 | 43.8 |
| State of Montana | 13.1 | 21.9 | 6.3 | 35.3 | 38.5 | 57.2 | 19.4 |

[1] Data are for public lands listed in Montana Department of Revenue and Montana Department of Administration, 2010.

Alternatives CND and CSD would cross more state land and more BLM land than the proposed route. Although Alternative CND would cross more state land in Montana, it would follow the route of Alternative SCS-A outside of Montana. This would result in impacts to sensitive public lands not affected by either Alternative CSD or the proposed Project route. Alternative CND would affect public land such as the Little Missouri National Grassland in North Dakota and the Missouri River National Recreational Area in South Dakota and Nebraska. Therefore, Alternative CND is not considered environmentally preferable with regard to the use of public land.

### I-2.3.4.3 Estimated Construction Costs

Table I-2.3-5 lists the estimated construction costs for the alternatives in Montana and for the Steele City Segment. The estimated construction cost per mile includes the pipeline, pump stations, and the electrical power supply for the pump stations. Keystone has stated that the cost of the pipeline alone would be approximately 30 percent of the total cost per mile.

| TABLE I-2.3-5<br>Estimated Construction Cost of Alternatives | | | |
|---|---|---|---|
| | Estimated Construction Cost[1] | | |
| Alternative/Segment | Per Mile of Alternative/Segment | Total Cost in Montana | Total Cost for Steele City Segment[2] |
| Proposed Route − Canada to Missouri River Segment | $2,630,731 | $234,135,059 | - |
| Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment | $2,860,000 | $267,410,000 | - |
| Proposed Route − Missouri River to South Dakota Segment | $2,630,731 | $509,046,449 | - |
| CSD − Missouri River to South Dakota (MRSD) Segment | $2,860,000 | $563,420,000 | - |
| Canada to North Dakota (CND) | $2,730,000 | $506,142,000 | $2,524,431,000 |
| CSD − Entire Route | $2,860,000 | $830,830,000 | $2,457,312,000 |
| Proposed Route − Entire Route | $2,630,731 | $743,707,654 | $2,240,330,520 |

[1] Estimated construction costs includes estimated cost of pipeline construction plus 30 percent for the estimated cost of the pump stations and electrical power supply for the pump stations.
[2] The Steele City Segment extends from the Montana-Saskatchewan border near the Port of Morgan, Montana to Steele City, Nebraska.

The routes for Alternatives CSD and CND were not surveyed, and therefore the estimated construction costs for those alternatives were based on elevation maps, GIS data, aerial photographs, and other information that is not as precise as on-the-ground evaluations. In addition, none of the alternatives include the estimated costs of procuring the ROW. For the portions of the alternatives that cross private land, the total cost of ROW acquisition (e.g., the costs of attorneys, filings, payments to landowners for easements, surveys, and land agents) would be from about $30,000 to $40,000 per mile. The basic costs to acquire ROWs across public land would be similar, but there would be additional costs for complying with the specific requirements imposed upon Keystone by each land management agency for use of the ROW. Because those requirements are not known at this time, the cost of ROW acquisition across public lands could not be estimated.

The estimated total construction cost of Alternative CND would be less than that for Alternatives CSD or SCS-B in Montana but would be the greatest for the Steele City Segment. The estimated construction cost of the proposed Project route would be about $237.6 million more than Alternative CND in Montana but $284.1 million less for the Steele City Segment. The estimated construction cost of Alternative CSD would be greater than for the proposed route in Montana and for the entire Steele City Segment. The proposed route would cost about $87.1 million less to construct in Montana than Alternative CSD and about $217.0 million less for the entire Steele City Segment.

### I-2.3.4.4 Conclusions

#### CND Alternative

As described in Section I-2.3.2, Alternative CND would connect to Alternative SCS-A in Williams County, North Dakota; from there, Alternative SCS-A would continue to the Cushing Extension. This Steele City alternative would be 65.5 miles longer than Alternative CSD and 73.1 miles longer than the proposed route, and the area of construction impacts would also be greater as compared to those of Alternative CSD and the proposed route. The estimated construction cost of Alternative CND for the Steele City Segment is about $67.1 million more than that of Alternative CSD and about $284.1 million more than that of the proposed route. Although Alternative CND would cross more state lands than the proposed route, it would cross substantially less state land than Alternative CSD. In addition, Alternative CND and the connected Alternative SCS-A outside of Montana would cross more federal land than the proposed route. Therefore, Alternative CND was eliminated from further consideration.

#### Alternative CSD Compared to the Proposed Route

After removing Alternative CND from further consideration, MDEQ conducted a more detailed review of Alternative CSD and found many unusual angles along the alignment that appeared to be artifacts of the modeling effort. To develop a more realistic alternative pipeline route, MDEQ straightened the Alternative CSD alignment where appropriate and also adjusted it to avoid the steepest terrain, multiple crossings of the same stream, residences, and irrigated lands. These adjustments resulted in slightly more private land being crossed, as compared to the originally modeled Alternative CSD. This MDEQ-revised Alternative CSD is termed the “modified Alternative CSD” (or “modified segment”) in the remainder of this section to differentiate it from the original model-produced Alternative CSD (or segments of that alternative) presented in Keystone’s MFSA application.

The potential impacts to key resources of the modified Alternative CSD north of the Missouri River (modified CMR segment) were then compared to those of the proposed route north of the river, and the potential key impacts of the modified Alternative CSD from the Missouri River to the Montana-South Dakota border (modified MRSD segment) were compared to those of the proposed route south of the river to the state border. Table I-2.3-6 presents the comparisons.

| TABLE I-2.3-6<br>Comparison of the Canada to South Dakota (CSD) Alternative with the Proposed Route | | |
|---|---|---|
| | Approximate Miles of Land Crossed Except where Noted[1] | |
| Location and Item | Segment of Canada to South Dakota (CSD) Alternative | Segment of Proposed Route |
| **Canada to Missouri River Segment** | | |
| Total Length | 93.5 | 89.1 |
| Montana Dept. of Fish, Wildlife & Parks (MFWP) Designated Core Habitat of Sage-Grouse | 22.5 | 20.2 |
| Number of Sage-Grouse Leks within 4 miles of Centerline | 5 | 4 |
| Number of Wells within 0.25 mile of Centerline | 11 | 26 |
| Number of Parcels Crossed with Dwelling Indicated | 8 | 14 |
| Slopes from 0% to ≤ 5% | 71.6 | 57.6 |
| Slopes > 5% and ≤ 15% | 18.9 | 26.7 |
| Slopes > 15% and ≤ 30% | 2.5 | 4.3 |
| Slopes > 30% | 0.3 | 0.5 |
| Conservation Reserve Program (CRP) or Fallow | 20.3 | 22.6 |
| Range Land | 70.9 | 64.2 |
| Hay Land | 0 | 0.1 |
| Irrigated Land | 2.2 | 2.1 |
| Non-Commercial Forested Land | 0.1 | 0.1 |
| BLM Land | 34.6 | 22.2 |
| State Land | 21.9 | 13.1 |
| Private Land | 36.8 | 53.0 |
| **Missouri River to Montana/South Dakota Border** | | |
| Total Length | 197.0 | 193.6 |
| MFWP Designated Core Habitat of Sage-Grouse | 0.0 | 0.0 |
| Number of Sage-Grouse Leks within 4 miles of Centerline | 25 | 31 |
| Number of Wells within 0.25 mile of Centerline | 50 | 100 |
| Number of Parcels Crossed with Dwelling Indicated | 15 | 33 |
| Slopes from 0% to ≤ 5% | 77.2 | 62.7 |
| Slopes > 5% and ≤ 15% | 102.8 | 114.1 |
| Slopes > 15% and ≤ 30% | 15.7 | 15.8 |
| Slopes > 30% | 1.4 | 1.0 |
| CRP or Fallow | 26.6 | 57.2 |
| Range Land | 164.4 | 130.6 |
| Hay Land | 5.8 | 4.6 |
| Irrigated Land | 0.0 | 1.0 |
| Non-Commercial Forested Land | 0.2 | 0.2 |
| U.S. Army Corps of Engineers Land | 1.0 | 1.0 |
| National Wildlife Refuge Land | 0.2 | 0.2 |
| BLM Land | 77.7 | 21.6 |
| State Land | 35.3 | 6.3 |
| Private Land | 82.6 | 164.3 |

Sources: sources used for data in the table are listed in Section I-2.4.1.

[1] Mileage rounded to nearest tenth.

### *Summary of Comparisons*

From the Canadian border to the Missouri River, the proposed route would be about 4.4 miles shorter than the modified CMR segment and would cross 2.3 fewer miles of sage-grouse habitat, about 6.7 fewer miles of range land, about 0.1 mile less irrigated land, about 8.8 fewer miles of state land, and about 12.4 fewer miles of BLM land. The proposed route segment also would have one less known sage-grouse lek within 4 miles than the modified CMR segment. The modified CMR segment would have 15 fewer wells within 0.25 mile, six fewer parcels with a dwelling indicated, more gradual slopes, about 2.3 fewer miles of CRP or fallow land, about 0.1 fewer miles of hay land, and about 16.2 fewer miles of private land.

From the Missouri River to the state border, the proposed route would be about 3.4 miles shorter than the modified MRSD segment and would cross more gradual slopes, about 33.8 fewer miles of range land, about 1.2 fewer miles of hay land, about 29.0 fewer miles of state land, and about 56.1 fewer miles of BLM land. The modified MRSD segment would have six fewer known sage-grouse leks within 4 miles, 50 fewer wells within 0.25 mile, cross 18 fewer parcels with a dwelling indicated, cross 30.6 fewer miles of CRP or fallow land, cross about 1.0 fewer miles of irrigated land, and would cross 81.7 fewer miles of private land.

Although the modified Alternative CSD would cross substantially more public land in Montana, its implementation would result in a longer construction ROW and a greater total area of construction impacts in Montana and along the Steele City Segment as compared to the proposed route. In addition, the greater length of the modified Alternative CSD would result in about a nine percent increase in construction cost for the Steele City Segment of the proposed Project.

### *Conclusions*

MFSA regulations require that MDEQ identify the alternative that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land. The modified Alternative CSD would cross approximately three times as much state land in Montana as the proposed route (57.2 miles versus 19.4 miles) and nearly three times as much federal land as the proposed route (112.3 miles versus 43.8 miles).

As a result of this comparison, MDEQ determined that it was not reasonable to carry forward the entire modified Alternative CSD because of its additional impacts and costs compared to Keystone's proposed route. However, portions of the modified Alternative CSD would cross more public land as compared to the proposed route segments in those areas. As a result, MDEQ considered those portions of the modified Alternative CSD as variations to the proposed route. Section I-2.4.3 presents descriptions of those variations along with comparisons of key environmental concerns along the variations and the segments of the proposed route that they would replace.

## I-2.4 MONTANA ROUTE VARIATIONS AND KEYSTONE REALIGNMENTS

Variations and realignments are relatively short deviations from the proposed Project route, that were developed to resolve or reduce construction impacts to localized, specific resources such as land ownership, terrain, residences and other structures, cultural resources, wetlands and streams, and wildlife conditions. They are different from major proposed Project route alternatives in that alternatives, such as those identified in Section 4.3 of the EIS and in Section I-2.3 of this appendix, are typically substantial distances from the proposed pipeline route, are generally much longer than variations and realignments, and were developed to reduce overall environmental impacts while meeting the purpose and need of the proposed Project. Although route variations and realignments also may be many miles in length, they are typically shorter and nearer to the proposed Project route than a major route alternative. Many requests for variations and realignments were submitted by concerned landowners.

Section I-2.4.1 describes the methods used to develop and evaluate route variations and realignments for the proposed Project. Section I-2.4.2 presents a comparison of the Montana proposed route variations with the segments of the proposed Project route that would be replaced by those variations. Section I-2.4.3 presents similar comparisons between the Keystone proposed realignments and the associated segments of the proposed Project route. For the purposes of the determinations under MFSA, the 2010 and 2011 route variations (MTVs) and 2010 realignments (KEYs) described below are considered to be modifications to Keystone's proposed Project, as defined in the December 2008 MFSA application (and referred to as the 2009 alignment in this appendix). This section compares the Montana proposed route variations developed throughout 2010 and 2011to the Keystone proposed 2010 realignments (which comprise the revised proposed Keystone route).

### I-2.4.1 DATA SOURCES AND METHODS

The following sections describe the variables, data sources, and methods used to compare the Montana proposed route variations and the Keystone proposed realignments against each other, or the proposed Project route, as appropriate.

#### I-2.4.1.1 DEVELOPMENT OF ROUTE VARIATIONS AND REALIGNMENTS

During its environmental review process, MDEQ developed route variations to avoid or minimize impacts to specific resources, to increase the use of public lands, or to avoid or minimize conflicts with existing or proposed residential and agricultural land uses. Other variations were developed in response to requests submitted by concerned landowners.

To receive MDEQ approval, the proposed Project must conform to the criteria in Section 75-20-301, MCA, (see Section I-1.0) and the decision standards in Administrative Rules of Montana (ARM) 17.20.1604 and ARM 17.20.1607. Several variations were developed to conform to Section 75-20-301(1)(h), MCA, which requires that the use of public land be given a preference where its use is as economically practicable as the use of private land.

For route variation development, the following were the primary areas to be avoided to the extent practical, or used minimally:

- Residences;
- Wells;
- Irrigated land;
- Cultural resources;
- Stream crossings;
- Transmission line structures;
- Major elevation changes; and
- Steep slopes.

In addition, forested areas were generally avoided to the extent practical and, where possible, variations were developed to be parallel to existing linear facility ROWs (i.e., routes that overlap, are directly adjacent to, or are within 150 feet of an existing ROW).

Initially, 19 variations to the 2009 proposed Project route were identified in Montana and described in the draft EIS. Each variation was given the designation of MTV (i.e., Montana Variation) and a number (e.g., MTV-11). These 19 variations were evaluated in the draft EIS, and MDEQ identified nine tentatively preferred variations to the proposed Project, including MTV-1, -2, -5, -6, -9, -11, -15, -17, and -19.

However, during 2010 and 2011, landowners submitted requests to consider additional variations in the EIS, and landowner field visits were conducted from June 29, 2010 through June 2011. MDEQ studied these additional variations to the 2009 proposed Project. As a result of those requests, a total of 50 variations were identified in Montana, ranging in length from about 0.2 mile to about 42.0 miles.

Simultaneously, Keystone also conducted their own additional studies of potential reroutes to the 2009 proposed Project route, as well as those suggested by landowners and MDEQ. This resulted in the creation of 48 Keystone realignments (identified as KEY-1, for example), ranging in length from about 0.2 mile to about 4.1 miles. An overview of all 50 MDEQ variations is depicted in Figure I-2.4.2-1, and additional details are provided in Figures I-2.4.2-2 through I-2.4.2-24. Similarly, an overview of all 48 Keystone realignments is depicted in Figure I-2.4.3-1, and additional details are provided in Figures I-2.4.3-2 through I-2.4.3-24. The location of the variations and realignments can also be viewed from MDEQ's web mapping application at http://svc.mt.gov/deq/wmaKeystoneXL.

#### I-2.4.1.2 Comparison of Route Variations and Realignments with the Proposed Route

The following sections first provide an overview of the variables used to compare the variations and the realignments to the proposed Project route. This overview is then followed by a more detailed discussion about the methods and data sources used for stream crossings, cultural resources, paleontological resources, biological resources (e.g., wetlands and noxious weed areas), greater sage-grouse and sharp-tailed grouse leks, and construction and environmental mitigation costs.

#### I-2.4.1.3 Variables and Methods Used for Route Comparisons

Sections I-2.4.2 and I-2.4.3 provide the primary reasons for developing the variations and realignments, as well as tabular comparisons of the key environmental characteristics and other data associated with each segment (presented in Tables I-2.4.2-1 through I-2.4.2-30 and Tables I-2.4.3-2 through I-2.4.3-33, respectively). In each table, 17 variables were used to compare each MDEQ variation or Keystone realignment to the corresponding proposed route segment.

For each variable in the tables, the appropriate route segment was used as the reference point for calculating the difference between the value listed for the route segment and the value listed for the variation or realignment (i.e., the value listed for each item of the variation or realignment was subtracted from the value listed for the route segment). The following are two examples of how those differences were calculated:

- If the route segment was 4 miles long and the variation was 1 mile long, the difference listed would be +3 (i.e., the route segment is 3 miles longer than the variation).
- If there were two perennial streams crossed by the route segment and four perennial streams crossed by the variation, the difference listed would be -2 (i.e., the route segment would cross two fewer perennial streams than the variation).

Each of the MTV variations developed throughout 2010 and 2011were generally compared to the Keystone realignments that together now comprise the 2010 proposed Project route (in very selected cases the comparison was made to portions of the original 2009 alignment), as defined in each table. These comparisons were made using the 15 criteria or variables, as outlined below:

- Length: the length in miles of the variation or realignment, and the route segment that would be replaced;
- Land Cover: the distance in miles across developed, forested/woodlands, and wetlands (from the United States Geological Survey [USGS], 2001);
- Revenue Final Land Unit Classification: the distance in miles across range land, irrigated land, and hay land, which includes non-irrigated farmland, noncommercial forest land, and summer fallow farmland (from Montana Center Department of Revenue, 2010);
- Land ownership: the distance in miles across state, private, BLM, and local government lands as well as across existing ROWs (from Montana Department of Revenue and Montana Department of Administration, 2010);
- Road Crossings: the number of major roads (e.g., U.S., state, and secondary highways), and other minor roads crossed (from ESRI, 2003);
- Railroad Crossings: the number of railroads crossed (from ESRI, 2002);
- Stream Crossings: the number of perennial and intermittent streams crossed (from ESRI, 2004), as well as the number of streams crossed that were not identified as a perennial or intermittent stream from the ESRI (2004) data (i.e., listed as USGS streams and obtained from USGS maps, dated 1966 to 1984);
- Slope: the length in miles of slopes crossed using four categories (from USGS, 2002):
    - slopes less than 5 percent,
    - slopes equal to or greater than 5 percent but equal to or less than 15 percent,
    - slopes greater than 15 percent but equal to or less than 30 percent, and
    - slopes greater than 30 percent;
- Water Wells: the number of water wells located within 100 feet of the centerline of the pipeline (from the Montana Bureau of Mines and Geology, 2010);
- Residences: the number of residences located within 25 feet and within 500 feet of the edge of the construction ROW (from the Montana Basemap Service Center, 2010 and MDEQ field surveys);
- Structures: the number of other types of structures located within 25 feet and within 500 feet of the edge of the construction ROW (from Montana Basemap Service Center, 2010 and MDEQ field surveys). Structures included only commercial and industrial buildings and outbuildings; residences and water wells were separated out, as described above;
- Cultural and Paleontological Resources:
    - the number of cultural resources located within a 300-foot-wide Area of Potential Effect (APE), based upon Class I research in historic Government Land Office maps, Cultural Resource Annotated Bibliography System (CRABS) and the Cultural Resource Information System (CRIS); and the number of previously recorded cultural resources by township, range, and section (TRS) (provided by the Montana SHPO, January 2011), or

- the number of eligible, potentially eligible, or non-eligible cultural resources located within a 300-foot-wide Area of Potential Effect (APE), based upon the results of Class III field surveys conducted in 2010 and 2011;
- the number of significant and non-significant paleontological resources located within a 300-foot-wide Area of Potential Effect (APE), based upon the results of field surveys conducted in 2010;

- Biological Resources: the number and type of wetlands, and the number of noxious weed areas crossed by a route centerline, as identified by field surveys conducted in 2010 (from the Keystone September 2010 Montana Summary Report, and also subsequent additional information provided by Keystone);
- Greater Sage-grouse and Sharp-tailed Grouse Leks:
  - as presented in the comparison tables and text, the length in miles across greater sage-grouse core areas; and the number of greater sage-grouse and the number of sharp-tailed grouse leks within 1, 2, 3, and 4 miles of the routes (from the Montana Department of Fish, Wildlife and Parks [MFWP, February 2011]), or
  - as also described in the text only, the number of greater sage-grouse leks located within 3 miles of the centerline, as identified by field surveys conducted in 2010, and the degree to which terrain would obscure the visibility of the pipeline from these greater sage-grouse leks.
- Construction and Environmental Mitigation Costs:
  - the estimated cost per mile of pipeline construction,
  - the estimated total pipeline construction cost (either provided by Keystone or estimated using $2.1 million per mile), and
  - the environmental mitigation costs for impacts to core areas and important greater sage-grouse habitat (estimated using $600 per acre of ROW).

Because route variations and realignments were identified in response to the preference to site the proposed Project on public land, to avoid or minimize specific environmental impacts, to avoid land use conflicts, or in response to landowner comments, they may not clearly display an environmental advantage other than reducing or avoiding impacts to specific features or resources. Conversely, the proposed alignment may not conform to regulatory requirements under MFSA. Further, the variations and realignments are generally close to the route segments that they would replace and extend across similar terrain, the construction methods for the variations and realignments would be essentially the same as those of the route segments, and the appearance of the proposed Project along the routes of the variations and realignments after construction and reclamation are completed could be similar to the appearance along the segments. As a result, for many resources the impacts associated with implementation of the variations and realignments could be essentially the same as the impacts that would result from construction and operation of the route segments, except where noted below.

The following sections provide some additional details about the data sources and methods that were used to conduct the comparative analysis of the variations and the realignments.

#### I-2.4.1.4 Description of Studies and Methods

### Stream Crossings

The number of stream crossings was evaluated using the ESRI 2004 detailed streams database for Montana and electronic copies of USGS 7 ½ minute topographic quadrangles (a total of 58 quadrangles dated 1966 to 1984). The ESRI database was used to identify perennial and intermittent streams. The USGS 7 ½ minute topographic quadrangles were used to identify other types of streams the proposed Project would cross, that were not identified in the ESRI database. Each MTV, KEY, and proposed route comparison was overlain on scanned versions of USGS 7 ½ minute topographic quadrangles. Then, streams mapped by the USGS, excluding those already identified in the ESRI database, were identified and provided in variation and realignment comparison tables.

### Cultural Resources

The cultural resources record search (provided by the Montana State Historic Preservation Office in January 2011) includes the Cultural Resource Annotated Bibliography System (CRABS), the Cultural Resource Information System (CRIS), and sites identified on state lands. Site specific information about cultural resources was not available at the time this EIS was prepared, and it is not known if any of the site surveys conducted for the proposed route are included in the dataset.

Stone features and areas with the potential for stone features to occur were identified along the proposed route. However, no known stone features were identified along any of the variations. As required by the Programmatic Agreement (PA; described in Section 3.11.3.2 of the EIS and presented in Appendix S and Attachment 1 of Appendix I), Keystone would conduct cultural resource surveys along the selected route variations to determine whether such resources were present. DOS would work with the tribes, the SHPO, and Keystone, in coordination with the other consulting parties in the PA, to develop the appropriate mitigation measures if these resources would be impacted by the proposed Project.

To assess the MDEQ route variations, Keystone realignments, and the proposed route, SWCA conducted Class I inventories and Class III field surveys in 2010. Class I inventories were completed using existing data from the cultural resource inventory files maintained by the Montana State Historic Preservation Office (SHPO) and included the Cultural Resource Annotated Bibliography System (CRABS), the Cultural Resource Information System (CRIS), and sites identified on state lands. Class I inventories served to identify known properties and were used to determine whether a more intensive inventory of specific areas was appropriate.

Class III intensive field surveys were conducted by professional archaeologists in a pedestrian survey of the 300-foot APE. The intent of the Class III inventory was to locate and record all cultural resources and was consistent with standards in the Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716). The Class III surveys were designed to produce a total inventory of the cultural properties observable within the APE.

Pedestrian surveys of the MDEQ route variations and Keystone realignments were conducted between May 17 and August 27, 2010 and covered 101.4 miles. The report of findings was sent to DOS on September 23, 2010 (Crossland et al. 2010). In cases where SWCA could not access properties, typically due to lack of landowner approval, Class III surveys were not conducted. Because these areas were not known until the end of the fieldwork season, a Class I inventory was carried out by SHPO staff and provided in January 2011. In these cases, the number of previously recorded cultural resources, identified by township, range, and section (TRS) that the variation passed through, were counted rather than those within the defined APE.

Cultural resources that were previously identified and those located during the Class III surveys were assessed for NRHP eligibility. In some instances, archeological sites were identified as potentially eligible or unevaluated when there were not sufficient data to assess the site. In these instances, testing and/or additional consultation with Tribes will be carried out. Known historic properties or those that are identified through testing and consultation will require mitigation through avoidance, professional monitoring, and/or data recovery excavations. Areas that require additional work will be included in a Historic Properties Treatment Plans developed under the PA.

## Paleontological Resources

To assess the MDEQ route variations, Keystone realignments, and the proposed route, SWCA conducted background research and analysis to identify known fossil resources and geologic formations. In conjunction with this background research, evaluation of the 300-foot APE was conducted to identify paleontological sensitivity of geological formations using the Potential Fossil Yield Classification System (PFCS). Field surveys were then conducted for all paleontologically sensitive areas with exposed fossiliferous rock in the 300-foot APE.

## Biological Resources

A 300-foot-wide survey corridor, 150 feet on each side of a proposed variation, realignment, or proposed Project route, was utilized to conduct all biological surveys. Biological surveys were conducted by trained professional biologists to identify wetlands and noxious weed areas. Biological resources are presented for the proposed route, variations, and realignments as the number and type of wetlands and the number of noxious weed areas crossed by a route centerline. Biological resources were obtained from the Keystone September 2010 Montana Summary Report.

### *Greater Sage-grouse and Sharp-tailed Grouse Leks*

Aerial greater sage-grouse surveys were conducted via helicopter in the spring of 2010, searching a corridor that was 4 miles on either side of a route segment centerline. The identified leks are noted within the text for variations and realignments that were surveyed. The core greater sage-grouse areas were identified using MFWP data, obtained in February 2011. MFWP defines core areas as habitats associated with the highest density of greater sage-grouse and lek complexes and associated habitat important to distribution.

For each route, the miles of greater sage-grouse core areas crossed and the number of greater sage-grouse and sharp-tailed grouse leks were identified using MFWP data (February 2011). These greater sage-grouse and sharp-tailed grouse leks are presented in the tables as being within 1, 2, 3, or 4-miles of a route centerline. The counts for each concentric circle are cumulative, meaning that they include the counts of the smaller circle (e.g., if one lek is identified within 2 miles and three leks are identified within 3 miles, it means that there are two leks located beyond the 2-mile circle but within 3 miles).

## Construction and Environmental Mitigation Costs

The routes of all of the variations and realignments have not been surveyed, and therefore the estimated construction costs for them were based on elevation maps, GIS data, aerial photographs, and other information that was not as precise as on-the-ground evaluations. Where specific engineering was not completed and a cost estimate was not provided by the Applicant, it was assumed that the costs of construction for a variation or realignment would be $2.1 million per mile. These estimated costs are only for the cost of the pipe and for construction; they do not include the cost of constructing pump stations and electrical distribution lines and connections. In addition, the estimated costs do not include the cost of procuring the ROW. For portions of the routes across private land, the total cost of ROW acquisition (e.g., the costs of attorneys, filings, easement remunerations, surveys, and land agents) would be from about $30,000 to $40,000 per mile. The costs to acquire ROWs across public land would include many of the same expenditures, but would also include the additional costs of complying with the specific requirements imposed on Keystone by the land management agency for use of the ROW. Because those requirements are not known at this time, the cost of ROW acquisition across public lands could not be estimated.

The MFWP suggested a $600 per acre compensatory environmental mitigation package for loss of the use of sagebrush habitat as a result of pipeline construction. The mitigation costs were based upon the average per acre cost of unimproved rangeland in the proposed Project area. Greater sage-grouse habitat was identified as either greater sage-grouse core areas or as distribution areas defined by the MFWP. Greater sage-grouse core areas were located along the proposed pipeline from approximately mileposts 44 to 64, and greater sage-grouse distribution areas that the MFWP identified were located from mileposts 96.5 to 131.0. These greater sage-grouse distribution areas were defined by the MFWP as nesting/early brood rearing and year round/overall distribution and were not included if they occurred on fallow farmland, which was defined from the Revenue Final Land Unit Classification listed above.

### I-2.4.2 MONTANA ROUTE VARIATIONS

#### I-2.4.2.1 Route Variation MTV-1 (Phillips/Valley County Variation)

MTV-1 (see Figure I-2.4.2-2 and Table I-2.4.2-1) was developed primarily to increase the amount of public land crossed, in comparison to the proposed Project route. In addition, it would be downstream rather than upstream of the Frenchman Reservoir, which would serve as a precaution against a possible spill affecting this locally important body of water. MTV-1 would be approximately 2 miles longer than the 2010 proposed route segment, which would include KEY-2, KEY-3, and KEY-4 (see Section I-2.4.3).

Implementation of MTV-1 would use more public land, including 6.7 miles of BLM land and 1.2 miles more of state land. It would cross 0.5 mile more developed land and more range and hay land. MTV-1 would be closer to one residence but farther from one structure, and would cross the same number of minor roads as the 2010 proposed route segment. Field surveys found that MTV-1 would cross seven more potentially eligible cultural resources and three more non-eligible cultural resources. A survey of paleontological sites found that MTV-1 would affect three fewer non-significant sites.

MTV-1 would cross 0.1 mile each less of wetlands and forested/woodland areas, two fewer intermittent streams, and 12 fewer USGS streams than the route segment it would replace, and would extend across a shorter distance of moderate slope. Desktop data indicated that MTV-1 also would be farther from greater sage-grouse habitat and one greater sage-grouse lek than the route segment, and field surveys confirmed that the route segment would be within 3 miles of one lek. As a result, the estimated cost per mile of pipeline construction would be greater for Keystone's proposed route segment than for MTV-1. However, due to the greater length of MTV-1, its total estimated construction cost would be greater than that of the proposed route segment.

MDEQ tentatively identified MTV-1 as its preferred alternative in the draft EIS in place of the 2009 proposed route segment. However, since publication of the draft EIS, additional information became available to compare the 2010 proposed route (including KEY-2, KEY-3, and KEY-4) with MTV-1 and a landowner's request, which is presented below as MTV-1a. A hydraulic design review of the potential impacts of the additional 2.0 miles of centerline that would be required for MTV-1 indicated that pump station 10 in Valley County would have to be relocated a minimum of 1.25 miles upstream to maintain a nominal capacity of 830,000 barrels per day (bpd). To maintain this nominal capacity, the route variation in this segment (between pump stations 9 and 10) could not exceed 1.12 miles (1.8 km). With the additional 2.0 miles to incorporate MTV-1 into this pipeline segment, the nominal capacity would be reduced to about 800,000 bpd. Depending upon the final revised location of pump station 10, a relocation of pump station 11 in McCone County approximately 0.75 mile upstream also could be required.

Most of the land within several miles upstream of the proposed pump station 10 is either a Nature Conservancy easement or owned by the BLM. If a suitable site for pump station 10 could be acquired, the potential impacts of relocating each pump station would include additional costs of $850,000 related to land acquisition, civil survey, pipeline engineering, environmental survey, geotechnical investigation, power line routings, station design, and hydraulic reviews. In addition, the power provider would have to conduct a new power line routing study and lose the right-of-way they have already acquired.

After consideration of the potential engineering concerns and greater impacts to cultural resources, MDEQ did not select MTV-1.

#### I-2.4.2.1a Route Variation MTV-1 with Segment MTV-1a (Phillips/Valley County Variation A)

MTV-1a (see Figure I-2.4.2-2 and Table I-2.4.2-1a) was developed primarily to avoid wells, a private landing strip, and a saline seep control project. In doing so it increased the amount of public land crossed in comparison to the proposed route. This variation would include a landowner’s request to avoid a saline seep project from about milepost 15 to milepost 20. Use of MTV-1 with segment MTV-1a would be 2.57 miles longer than the proposed route. The variation would cross 1.13 miles more state land and 6.95 miles more BLM land.

MTV-1a would cross 0.92 mile more developed land, three fewer minor roads, and would not be near any residences or structures. For cultural findings, the variation would cross seven more potentially eligible cultural resources and three more non-eligible cultural resources. About 93 percent of cultural surveys were completed for MTV-1a. MTV-1a also would cross three fewer non-significant paleontological sites.

MTV-1a would cross no forested/woodlands, 0.12 mile less wetlands, two fewer intermittent streams, and 12 fewer USGS streams. For biological resources, the 2010 proposed route would cross two wetlands (PEM and PSS) and four noxious weed areas, compared to none for MTV-1a. Desktop data indicated that MTV-1a would be farther from one greater sage-grouse lek, and field surveys confirmed that the route segment would be within 3 miles of one lek. Because of the proximity to greater sage-grouse leks, timing restrictions would be required along about 6.2 miles of the 2010 proposed Project route during mating and rearing periods. No such timing restrictions would be necessary along MTV-1 with MTV-1a.

In November 2010, Keystone advised MDEQ that due to route adjustments further south in Montana and other states, the design of pump stations 9 and 10 and the intervening segment had become a limiting factor. A hydraulic design review of the impacts of the additional 2.57 miles of centerline that would be required by MTV-1 indicated that pump station 10 in Valley County would have to be relocated a minimum of 1.25 miles upstream to maintain the nominal capacity of 830,000 bpd. To maintain this nominal capacity, the route variation in this segment (between pump stations 9 and 10) could not exceed 1.12 miles (1.8 km). With the additional 2.57 miles to incorporate MTV-1 into this pipeline segment, the nominal capacity would be reduced to about 800,000 bpd. Depending upon the final revised location of pump station 10, a relocation of pump station 11 in McCone County could be required approximately 0.75 miles upstream.

Keystone opposes MTV-1a and states the MFSA findings required for certification under 75-20-301 MCA or the preferred location criteria of Circular MFSA-2 are not satisfied, but MDEQ notes that

Keystone's proposed route does not maximize the use of public land as required by 75-20-301(1)(h), MCA. BLM indicates that the variation does not avoid and minimize impacts (Circular MFSA-2 75-20-301(1) (c) MCA) due to the cultural resources impacts. Topography would prevent redirecting MTV-1a away from six cultural sites, except on private land. After consideration of the potential engineering concerns and greater impacts to cultural resources, MDEQ did not select MTV-1a.

#### I-2.4.2.2 Route Variation MTV-2 (Rock Creek Variation) Compared to Keystone's 2009 Proposed Route

MTV-2 (see Figure I-2.4.2-3 and Table I-2.4.2-2) was developed to avoid constructing the pipeline diagonally across the face of a steep valley wall. The variation would be approximately 0.03 mile shorter than the 2009 route segment and would extend more directly through the valley. MTV-2 would not connect to KEY-6 on the 2010 proposed route, which is discussed in comparison to MTV-2a.

Other than the slopes, there is very little difference between MTV-2 and the 2009 proposed route and neither one would affect many resources. MTV-2 would cross one more minor road than the 2009 route segment, and the cost of that bore is included in the cost per mile listed in Table I-2.4.2-2. Both routes would affect one potentially eligible cultural resource and one significant paleontological site.

MTV-2 would extend up a steep slope, whereas the 2009 proposed segment would angle across greater distances of moderate and steep slopes. Construction of this variation would result in less ground disturbance than construction of the 2009 proposed route segment, the potential impacts due to erosion would be less, and revegetation of the ROW would be less difficult. Implementation of the appropriate reclamation and erosion control measures would be important to minimizing impacts with this variation. Although the estimated cost per mile of pipeline construction would be greater for the variation than for the 2009 proposed route segment, with costs for the latter partially offset by extending along a greater distance of low slopes, the total estimated construction cost of the adjusted 2009 proposed route segment would be greater than that of MTV-2 because of its greater length.

Based upon these considerations, MDEQ selected MTV-2 as part of the tentatively preferred route in place of the 2009 proposed route segment in the draft EIS. Since publication of the draft EIS, additional information has become available and is presented as MTV-2a and KEY-6. As a result, MTV-2 was not selected because KEY-6 was identified as the more appropriate and environmentally protective route.

**TABLE I-2.4.2-1**
**Comparison of Montana Route Variation 1 (MTV-1) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | 2010 Proposed Route Segment | MTV-1 | Difference |
|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | |
| **Length** | 25.9 | 27.9 | -2.0 |
| **Land Cover** | | | |
| Developed | 0.1 | 0.6 | -0.5 |
| Forested/ Woodlands | 0.1 | 0.0 | +0.1 |
| Wetlands | 0.3 | 0.2 | +0.1 |
| Total | 0.5 | 0.8 | -0.3 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 22.9 | 24.3 | -1.4 |
| Irrigated Land | 0.0 | 0.0 | 0.0 |
| Hay Land | 3.0 | 3.6 | -0.6 |
| Total | 25.9 | 27.9 | -2.0 |
| **Land Ownership** | | | |
| State of Montana | 4.0* | 5.2 | -1.2 |
| Private Land | 17.1 | 11.5 | +5.6 |
| U.S. Bureau of Land Management | 4.5 | 11.2 | -6.7 |
| Local Government | 0.3 | 0.0 | +0.3 |
| ROW | 0.0 | 0.0 | 0.0 |
| Total | 25.9 | 27.9 | -2.0 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 24 | 24 | 0 |
| Total | 24 | 24 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 9 | 7 | +2 |
| Additional USGS Streams | 37 | 25 | +12 |
| Total | 47 | 33 | +14 |

| Item | 2010 Proposed Route Segment | MTV-1 | Difference |
|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | |
| **Slope** | | | |
| < 5% | 15.1 | 18.6 | -3.5 |
| ≥ 5% and ≤ 15% | 9.2 | 8.3 | +0.9 |
| > 15% and ≤ 30% | 1.3 | 0.9 | +0.4 |
| > 30% | 0.3 | 0.1 | +0.2 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 1 | -1 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 1 | 0 | +1 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 9 Pot. Elg. (100%) | 16 Pot. Elg., 3 Not Elg., (100%) | -7 Pot. Elg., -3 Not Elg., |
| Paleo Findings (% Surveyed) | 5 Not Sig. (100%) | 2 Not Sig. (100%) | +3 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 1 | 0 | +1 |
| Sage-grouse Leks within 3 miles | 1 | 0 | +1 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |

**TABLE I-2.4.2-1**
**Comparison of Montana Route Variation 1 (MTV-1) with the Proposed Segment of the 2010 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | | | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| **Item** | **2010 Proposed Route Segment** | **MTV-1** | **Difference** | **Item** | **2010 Proposed Route Segment** | **MTV-1** | **Difference** |
| | | | | **Biology (survey data)** | | | |
| | | | | Biological Resources (% Surveyed) | 2 Wetlands (PSS, PEM), 4 Noxious Weeds (100%) | 0 (93%) | +2 Wetlands (PSS, PEM), +4 Noxious Weeds |
| | | | | **Construction Costs** | | | |
| | | | | Cost per mile | $1,900,000 | $1,880,000 | |
| | | | | Total Construction Cost | $49,210,000 | $52,452,000 | -$3,242,000 |

*Includes 0.26 mile of State Water Conservation Board Land.

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-1a**
**Comparison of Montana Route Variation 1a (MTV-1a) with the Proposed Segment of the 2010 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | | | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| **Item** | **2010 Proposed Route Segment** | **MTV-1a** | **Difference** | **Item** | **2010 Proposed Route Segment** | **MTV-1a** | **Difference** |
| **Length** | 25.9 | 28.46 | -2.57 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 15.15 | 18.26 | -3.11 |
| Developed | 0.06 | 0.98 | -0.92 | ≥ 5% and ≤ 15% | 9.16 | 9.12 | +0.04 |
| Forested/ Woodlands | 0.06 | 0.00 | +0.06 | > 15% and ≤ 30% | 1.29 | 1.00 | +0.29 |
| Wetlands | 0.34 | 0.22 | +0.12 | > 30% | 0.29 | 0.08 | +0.21 |
| Total | 0.46 | 1.20 | -0.74 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 22.92 | 25.58 | -2.66 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.10 | -0.10 | Residences within 500 ft | 0 | 0 | 0 |

**TABLE I-2.4.2-1a**
**Comparison of Montana Route Variation 1a (MTV-1a) with the Proposed Segment of the 2010 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| **Item** | **2010 Proposed Route Segment** | **MTV-1a** | **Difference** |
| Hay Land | 2.97 | 2.78 | -0.19 |
| Total | 25.89 | 28.46 | -2.57 |
| **Land Ownership** | | | |
| State of Montana* | 4.02 | 5.15 | -1.13 |
| Private Land | 17.08 | 11.82 | +5.26 |
| U.S. Bureau of Land Management | 4.54 | 11.49 | -6.95 |
| Local Government | 0.25 | 0.00 | +0.25 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 25.89 | 28.46 | -2.57 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 24 | 21 | +3 |
| Total | 24 | 21 | +3 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 9 | 7 | +2 |
| Additional USGS Streams | 37 | 25 | +12 |
| Total | 47 | 33 | +14 |

| | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| **Item** | **2010 Proposed Route Segment** | **MTV-1a** | **Difference** |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 9 Pot. Elg. (100%) | 16 Pot. Elg., 4 Not Elg. (100%) | +7 Pot. Elg., -4 Not Elg., |
| Paleo Findings (% Surveyed) | 5 Not Sig. (100%) | 2 Not Sig. (100%) | +3 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 1 | 0 | +1 |
| Sage-grouse Leks within 3 miles | 1 | 0 | +1 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 2 Wetlands (PSS, PEM), 4 Noxious Weeds (100%) | 0 (93%) | +2 Wetlands, +4 Noxious Weeds |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $54,369,000 | $59,766,000 | -$5,397,000 |

*Includes 0.26 mile of State Water Conservation Board Land.

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-2**
**Comparison of Montana Route Variation 2 (MTV-2) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-2 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-2 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.67 | 0.64 | +0.03 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.39 | 0.36 | +0.03 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.10 | 0.16 | -0.06 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.10 | 0.06 | +0.04 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.08 | 0.06 | +0.02 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.67 | 0.64 | +0.03 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.67 | 0.64 | +0.03 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.52 | 0.48 | +0.04 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.15 | 0.16 | -0.01 | Cultural Findings (% Surveyed) | 1 Pot. Elg. (100%) | 1 Pot. Elg. (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 1 Sig. (100%) | 1 Sig. (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.67 | 0.64 | +0.03 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 2 | -1 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 2 | -1 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Cost per mile | $1,900,000 | $1,960,000 | |
| Total | 0 | 0 | 0 | Total Construction Cost | $1,273,000 | $1,254,400 | +$18,600 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

#### I-2.4.2.2a Route Variation MTV-2a (Rock Creek Variation A) Compared to KEY-6

MTV-2a (see Figure I-2.4.2-3 and Table I-2.4.2-2a) was originally developed to avoid constructing the pipeline diagonally across the face of a steep valley wall. Since its development, Keystone revised its proposed route in 2010, which is described as KEY-6. This section compares MTV-2a, which is connected to the 2009 proposed route segment and MTV-2, to the corresponding segment of Key-6 (the 2010 proposed route segment).

The variation would extend from milepost 38.7 to milepost 40 and be about 0.2 mile shorter than KEY-6. MTV-2a would cross about 0.2 mile less state land and 0.03 mile less BLM land, but one more minor road. Both routes would cross one potentially eligible cultural resource and the variation would have one significant and one non-significant paleontological site. The variation would not cross any surveyed wetlands and one less noxious weed area, but would cross one additional USGS stream. As a result, MTV-2a was not selected because KEY-6 was identified as the more appropriate and environmentally protective route.

#### I-2.4.2.3 Route Variation MTV-3 (Willow to East Fork Cherry Creek Variation)

MTV-3 (see Figure I-2.4.2-4 and Table I-2.4.2-3) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-3 would extend across 11.7 fewer miles of private land but would be 2.4 miles longer than the 2010 proposed route segment, which includes KEY-7 through KEY-15. It would cross more public land than the proposed segment, including nearly 8 more miles of state land and 5 more miles of BLM land than the 2010 route segment.

MTV-3 would cross three more minor roads than the 2010 route segment. The variation would not be near residences or structures, whereas the 2010 route segment would be within 500 feet of two residences and seven structures. MTV-3 would also cross about 1,300 feet of the Cornwell Ranch Conservation Easement, which would be avoided by the proposed route. The conservation easement is located on glaciated grasslands and is part of the FWP’s Greater Sage-Grouse Core Area. In addition, according to Class I research the variation would cross 66 fewer cultural resources from TRS than the 2010 route segment. A Class III survey was not conducted for this variation.

MTV-3 would extend across less steeply sloped areas, which would offset the increased cost of construction across streams and roads. As a result, the estimated cost per mile of pipeline construction would be about the same for MTV-3 as for the 2010 route segment. However, due to its greater length, the total estimated construction cost of MTV-3 would be greater than that of the 2010 route segment.

The variation would cross one fewer USGS stream, would be farther from one sharp-tailed grouse lek, and would affect one additional greater sage-grouse lek. It also would extend through 2.4 miles more greater sage-grouse core habitat than the route segment and could require a pump station near a greater sage-grouse lek. Because the potential impact to greater sage-grouse habitat was considered more important than the use of more public land, MDEQ did not select MTV-3.

## TABLE I-2.4.2-2a
## Comparison of Montana Route Variation 2a (MTV-2a) with KEY-6 of the Proposed Segment of the 2010 Route it Would Replace

| Item | Miles of Land Crossed (except where noted) | | Difference |
|---|---|---|---|
| | KEY-6 | MTV-2a | |
| **Length** | 1.78 | 1.59 | +0.19 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.06 | 0.00 | +0.06 |
| Total | 0.06 | 0.00 | +0.06 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.78 | 1.59 | +0.19 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 1.78 | 1.59 | +0.19 |
| **Land Ownership** | | | |
| State of Montana | 1.08 | 0.89 | +0.19 |
| Private Land | 0.15 | 0.17 | -0.02 |
| U.S. Bureau of Land Management | 0.56 | 0.53 | +0.03 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 1.78 | 1.59 | +0.19 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 3 | -1 |
| Total | 2 | 3 | -1 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 1 | 2 | -1 |
| Total | 2 | 3 | -1 |

| Item | Miles of Land Crossed (except where noted) | | Difference |
|---|---|---|---|
| | KEY-6 | MTV-2a | |
| **Slope** | | | |
| < 5% | 0.76 | 0.55 | +0.21 |
| ≥ 5% and ≤ 15% | 0.54 | 0.70 | -0.16 |
| > 15% and ≤ 30% | 0.38 | 0.17 | +0.21 |
| > 30% | 0.10 | 0.17 | -0.07 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Pot. Elg. (100%) | 1 Pot. Elg. (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 1 Sig., 1 Not Sig. (100%) | +1 Sig., +1 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 3 Noxious Weeds (100%) | 2 Noxious Weeds (100%) | +1 Noxious Weed |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $3,087,000 | $2,688,000 | +$399,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-3**
**Comparison of Montana Route Variation 3 (MTV-3) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-3 | Difference | Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-3 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 39.6 | 42.0 | -2.4 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 24.9 | 29.9 | -5.0 |
| Developed | 0.4 | 0.3 | +0.1 | ≥ 5% and ≤ 15% | 12.7 | 10.9 | +1.9 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 1.9 | 1.1 | +0.8 |
| Wetlands | 0.4 | 0.3 | +0.1 | > 30% | 0.1 | 0.1 | 0.0 |
| Total | 0.8 | 0.6 | +0.2 | **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 27.9 | 33.0 | -5.1 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 2 | 0 | +2 |
| Hay Land | 11.7 | 9.0 | +2.7 | **Structures** | | | |
| Total | 39.6 | 42.0 | -2.4 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 7 | 0 | +7 |
| State of Montana | 3.7 | 11.6 | -7.9 | **Cultural Resources (Class I)** | | | |
| Private Land | 22.5 | 10.8 | +11.7 | Cultural Resources in 300-ft APE | 2 | 2 | 0 |
| U.S. Bureau of Land Management | 13.4 | 18.4 | -5.0 | Cultural Resources in TRS | 126 | 60 | +66 |
| Local Government | 0.0 | 1.2 | -1.2 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 20.2 | 22.6 | -2.4 |
| Total | 39.6 | 42.0 | -2.4 | Sage-grouse Leks within 1 mile | 0 | 1 | -1 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 1 | -1 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 3 | 4 | -1 |
| Minor Roads | 45 | 48 | -3 | Sage-grouse Leks within 4 miles | 3 | 4 | -1 |
| Total | 45 | 48 | -3 | Sharp-tailed Leks within 1 mile | 4 | 4 | 0 |
| **Number of Railroad Crossings** | 1 | 1 | 0 | Sharp-tailed Leks within 2 miles | 9 | 6 | +3 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 13 | 13 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 18 | 17 | +1 |
| Intermittent Streams | 20 | 20 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 36 | 35 | +1 | Cost per mile | $1,965,000 | $1,965,000 | |
| Total | 56 | 55 | +1 | Total Construction Cost | $77,814,000 | $82,530,000 | -$4,716,000 |
| | | | | Environmental Mitigation Cost | $161,600 | $180,800 | -$19,200 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-4 Route Variation MTV-4 (South Fork Shade Creek Variation)

MTV-4 (see Figure I-2.4.2-5 and Table I-2.4.2-4) was developed to address potential terrain alteration and erosion impacts from mileposts 114.5 to 115.3, where the 2009 route segment would cross between two badlands bluffs. The picture inset in Figure I-2.4.2-5 depicts the terrain that the 2009 proposed route would cross. Although the badlands are on BLM land, routing in this area could also affect adjacent private land.

The ESRI database for roads indicated that MTV-4 and the 2009 proposed segment would each cross one minor road (Table I-2.4.2-4). However, an additional review of aerial photographs indicated that each route had one additional minor road crossing (see Figure I-2.4.2-5). Cultural resources surveys did not find any resources on either route.

Although the ESRI database indicated that the routes would not cross any streams, additional review of the USGS maps showed that MTV-4 would cross four streams while the 2009 proposed route segment would cross two streams (Table I-2.4.2-4). Again, an additional review of aerial photographs indicated that the 2009 proposed route segment would cross three drainages, whereas MTV-4 would cross two drainages (see Figure I-2.4.2-5).

As an alternative to the mitigation provided by MTV-4, pipeline construction through the areas of concern could be accomplished using either the horizontal directional drilling (HDD) or horizontal boring method along the proposed route, or a smaller variation of the proposed route if geotechnical studies indicated that subsoil conditions were appropriate for use of either of those methods. Keystone would conduct further subsurface investigations to determine the feasibility of boring under this feature instead of trenching through it.

Although MTV-4 would be approximately 0.01 mile longer than the 2009 proposed route, it could result in less engineering and constructability concerns than along the more rugged terrain of the proposed route segment. However, it would not eliminate the potential to substantially alter terrain due to construction and erosion on the steep, sparsely vegetated, erodible soils of the area. Thus, the estimated cost of constructing MTV-4 would be less than the 2009 route segment because of the potential reduction in engineering costs, ease of constructability, the fewer number of streams, and the shorter distance along steeply sloped areas, as described above. Environmental mitigation cost would also be $320 less for the variation.

MTV-4 would cross slightly more BLM land than the 2009 route segment. With either MTV-4 or the 2009 proposed route segment, Keystone could use the HDD method for construction, but this would still result in traffic being routed around the badland terrain. Keystone proposed a revised realignment in this area that avoids the badlands, which is discussed as KEY-48 (see Section I-2.4.3.2.32). KEY-48 avoids the badlands bluffs and, therefore, MDEQ did not select MTV-4.

**TABLE I-2.4.2-4**
**Comparison of Montana Route Variation 4 (MTV-4) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-4 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-4 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.75 | 0.76 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.31 | 0.20 | +0.11 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 0.24 | 0.40 | -0.16 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.16 | 0.16 | 0.00 |
| Wetlands | 0.0 | 0.0 | 0.0 | > 30% | 0.03 | 0.00 | +0.03 |
| Total | 0.0 | 0.0 | 0.0 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.52 | 0.50 | +0.02 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.23 | 0.26 | -0.03 | **Structures** | | | |
| Total | 0.75 | 0.76 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.0 | 0.0 | 0.0 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.44 | 0.40 | +0.04 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.31 | 0.36 | -0.05 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.75 | 0.76 | -0.01 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 1 | 1 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 2 | 2 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 3 | 3 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 2 | 4 | -2 | Cost per mile | $2,100,000 | $2,040,000 | |
| Total | 2 | 4 | -2 | Total Construction Cost | $1,575,000 | $1,550,400 | +$24,600 |
| | | | | Environmental Mitigation Cost | $4,240 | $3,920 | +$320 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-5 Route Variation MTV-5 (East Fork Prairie Elk Creek Variation)

MTV-5 (see Figure I-2.4.2-6 and Table I-2.4.2-5) was developed to reduce the distance of construction through a channel migration zone of East Fork Prairie Elk Creek, which is a perennial stream. This variation would connect back into the 2009 proposed route segment at milepost 127.65. MTV-5 would cross the creek approximately 300 feet north (downstream) of the proposed crossing site but would be approximately the same length as the 2009 route segment it would replace. The East Fork Prairie Elk Creek crossing is discussed in the Stream Crossing Inspections Report for the proposed Project that is on file with MDEQ (see Section I-3.1 for a summary of key information from the report). MTV-5 would not connect to KEY-25 on the 2010 proposed route segment, which is the comparison for MTV-5a.

The 2009 proposed route segment would be located within 25 feet of one structure whereas MTV-5 would be located within 500 feet of one structure. Because MTV-5 would extend through less of the channel than the 2009 route segment it would replace, the estimated construction cost per mile of the variation would be less than that of the 2009 route segment. Environmental mitigation cost would be $3,200 for both the proposed route and the variation.

Construction of MTV-5 would result in fewer potential impacts associated with crossing East Fork Prairie Elk Creek. Since publication of the draft EIS, additional information has become available and is presented as MTV-5a and the 2010 proposed route segment identified as KEY-25. As a result of the analysis of MTV-5a and KEY-25, MDEQ did not select MTV-5.

### I-2.4.2-5a Route Variation MTV-5a (East Fork Prairie Elk Creek Variation A) Compared to KEY-25

MTV-5a (see Figure I-2.4.2-6 and Table I-2.4.2-5a) was developed to reduce the distance of construction through a channel migration zone of the East Fork Prairie Elk Creek. However, it would place the crossing in a deep pool and an ephemeral channel east of the creek crossing. MTV-5a would be 0.1 mile longer than the 2010 proposed route segment it would replace (KEY-25) and would extend from approximately mileposts 127.2 to 128.

Both routes would cross mostly privately-owned range land, one minor road, and would be within 500 feet of one structure. Neither the 2010 proposed route segment nor MTV-5a would cross cultural resource or paleontological sites. Both routes would cross the East Fork Prairie Elk Creek, and the 2010 proposed route would also cross three USGS streams. Neither the 2010 proposed route segment nor MTV-5a would cross any other biological features.

More recently, Keystone proposed a realignment (KEY-25) that has some of the same advantages of MTV-5a but also avoids being located in an intermittent stream channel about 0.2 mile east of the East Fork of Prairie Elk Creek. Therefore, in a compromise to achieve the least amount of environmental impact and to avoid a stream pool and intermittent stream channel, MDEQ selected a combined route that includes a portion of both MTV-5a and KEY-25. The selected route consists of the western most portion of KEY-25, to the point where MTV-5a and KEY-25 diverge; then from the divergence point it consists of the eastern portion of MTV-5a.

**TABLE I-2.4.2-5**
**Comparison of Montana Route Variation 5 (MTV-5) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-5 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-5 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.4 | 0.4 | 0.0 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.03 | 0.04 | -0.01 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 0.28 | 0.25 | +0.03 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.12 | 0.15 | -0.03 |
| Wetlands | 0.0 | 0.0 | 0.0 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.0 | 0.0 | 0.0 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.4 | 0.4 | 0.0 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.0 | 0.0 | 0.0 | **Structures** | | | |
| Total | 0.4 | 0.4 | 0.0 | Structures within 25 ft | 1 | 0 | +1 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 1 | -1 |
| State of Montana | 0.0 | 0.0 | 0.0 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.4 | 0.4 | 0.0 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.0 | 0.0 | 0.0 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.4 | 0.4 | 0.0 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 0 | 0 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossing** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Cost per mile | $2,100,000 | $2,080,000 | |
| Total | 1 | 1 | 0 | Total Construction Cost | $840,000 | $832,000 | +$8,000 |
| | | | | Environmental Mitigation Cost | $3,200 | $3,200 | $0 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-5a**
**Comparison of Montana Route Variation 5a (MTV-5a) with Key-25 of the 2010 Proposed Segment of the Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) KEY-25 | MTV-5a | Difference | Item | Miles of Land Crossed (except where noted) KEY-25 | MTV-5a | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.77 | 0.78 | -0.1 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.12 | 0.09 | +0.03 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.49 | 0.54 | -0.05 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.16 | 0.15 | +0.01 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.77 | 0.78 | -0.1 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.77 | 0.78 | -0.1 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 1 | 1 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.77 | 0.78 | -0.1 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.77 | 0.78 | -0.1 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | **Biology (survey data)** | | | |
| Additional USGS Streams | 3 | 0 | +3 | Biological Resources (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Total | 4 | 1 | +3 | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $1,617,000 | $1,638,000 | -$21,000 |
| | | | | Environmental Mitigation Cost | $6,240 | $6,160 | +$80 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-6 Route Variation MTV-6 (McCone/Dawson County Variation)

MTV-6 (see Figure I-2.4.2-7 and Table I-2.4.2-6) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route. MTV-6 would address a landowner request to site the pipeline farther from a residence (see Section I-2.4.2-7, Route Variation MTV-7, for additional details). MTV-6 would be 0.33 mile longer than the 2010 proposed route segment it would replace, but by using almost 7.94 miles more of state land it would reduce the amount of private land crossed by 6.91 miles. Pump station 12 would be moved along the route variation to about 2.7 miles south of the Redwater River crossing.

MTV-6 would avoid being within 500 feet of three more structures, within 100 feet of a water well, and crossing two railroads. Although MTV-6 would cross 22 more minor roads than the 2010 route segment, many of those roads would be crossed using open-cut construction methods, with costs similar to those of typical overland pipeline construction. As a result, the estimated cost per mile of pipeline construction would be greater for the 2010 route segment than for MTV-6. It also could cross five fewer eligible cultural resources.

MTV-6 would avoid crossing Buffalo Springs Creek. The 2010 proposed route segment would cross 0.34 mile more NLCD wetland areas, seven more intermittent streams, 10 more USGS streams, and also would extend across a greater distance of moderate to steeply sloped areas than MTV-6. Both routes would be within 2 miles of two sharp-tailed grouse leks.

MTV-6 would cross about 7.95 more miles of state land than the 2010 route segment and would not cross BLM land. It also would extend across less hay land than the 2010 route segment. Thus, MDEQ selected MTV-6 as part of the tentatively preferred route in place of the 2009 proposed route segment in the draft EIS. Since publication of the draft EIS, additional information has become available with the 2010 proposed route segment, MTV-6a, MTV-6b, and MTV-6c which are presented in Figure I-2.4.2-7 and Table I-2.4.2-6. As a result of the additional analysis, it was determined that MTV-6, with the incorporation of the MTV-6a, MTV-6b, and MTV-6c variations, would cross substantially more public lands without a substantial increase in construction costs from the 2010 proposed route segment. In addition, it avoids more structures and stream crossings, while providing easier constructability. Therefore, MDEQ has selected MTV-6, with the incorporation of MTV-6a, MTV-6b, and MTV-6c, which are detailed further below.

**TABLE I-2.4.2-6**
**Comparison of Montana Route Variations 6a-c (MTV-6a-c) with the Proposed Segment of the 2010 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | | | |
|---|---|---|---|---|---|
| **Item** | **2010 Proposed Route Segment*** | **MTV-6** | **MTV-6a** | **MTV-6b** | **MTV-6c** |
| **Length** | 30.67 | 31.00 | 31.10 | 31.03 | 31.04 |
| **Land Cover** | | | | | |
| Developed | 0.56 | 1.10 | 1.11 | 1.10 | 1.11 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.34 | 0.00 | 0.00 | 0.01 | 0.00 |
| Total | 0.90 | 1.10 | 1.11 | 1.11 | 1.11 |
| **Revenue Final Land Unit Classification** | | | | | |
| Range Land | 13.38 | 17.30 | 17.32 | 17.45 | 17.31 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hay Land | 17.29 | 13.70 | 13.78 | 13.58 | 13.73 |
| Total | 30.67 | 31.00 | 31.10 | 31.03 | 31.04 |
| **Land Ownership** | | | | | |
| State of Montana | 0.16 | 8.10 | 8.11 | 8.06 | 7.96 |

**TABLE I-2.4.2-6**
**Comparison of Montana Route Variations 6a-c (MTV-6a-c) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | 2010 Proposed Route Segment* | MTV-6 | MTV-6a | MTV-6b | MTV-6c |
|---|---|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | | | |
| Private Land | 29.90 | 22.90 | 22.99 | 22.97 | 23.08 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Local Government | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 30.67 | 31.00 | 31.10 | 31.03 | 31.04 |
| **Number of Road Crossings** | | | | | |
| Major Roads | 3 | 3 | 3 | 3 | 3 |
| Minor Roads | 20 | 42 | 28 | 28 | 28 |
| Total | 23 | 45 | 31 | 31 | 31 |
| **Number of Railroad Crossings** | 2 | 0 | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | | |
| Perennial Streams | 0 | 0 | 0 | 0 | 0 |
| Intermittent Streams | 15 | 8 | 8 | 8 | 8 |
| Additional USGS Streams | 45 | 35 | 34 | 34 | 34 |
| Total | 60 | 43 | 42 | 42 | 42 |
| **Slope** | | | | | |
| < 5% | 6.53 | 7.20 | 7.53 | 7.28 | 7.10 |
| ≥ 5% and ≤ 15% | 22.08 | 22.00 | 21.85 | 22.02 | 22.17 |
| > 15% and ≤ 30% | 1.90 | 1.70 | 1.63 | 1.64 | 1.67 |
| > 30% | 0.16 | 0.10 | 0.09 | 0.09 | 0.10 |
| **Water Wells within 100 ft** | 1 | 0 | 0 | 0 | 0 |
| **Residences** | | | | | |
| Residences within 25 ft | 0 | 0 | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 | 0 | 0 |
| **Structures** | | | | | |
| Structures within 25 ft | 0 | 0 | 0 | 0 | 0 |
| Structures within 500 ft | 4 | 1 | 1 | 1 | 1 |
| **Cultural Resources (Class III)** | | | | | |
| Cultural Findings (% Surveyed) | 6 Elg., 1 Not Elg. (100%) | 1 Elg., 3 Not Elg. (100%) | 1 Elg., 3 Not Elg. (100%) | 1 Elg., 3 Not Elg. (97%) | 1 Elg., 3 Not Elg. (100%) |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 (100%) | 0 (97%) | 0 (100%) |
| **Grouse (desktop data)** | | | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 2 | 2 | 2 | 2 | 2 |
| Sharp-tailed Leks within 3 miles | 2 | 2 | 2 | 2 | 2 |
| Sharp-tailed Leks within 4 miles | 2 | 2 | 2 | 2 | 2 |
| **Biology (survey data)** | | | | | |
| Biological Resources (%Surveyed) | 5 Wetlands (PEM), 9 Noxious Weeds (100%) | 3 Wetlands (PEM), 4 Noxious Weeds (90.1%) | 3 Wetlands (PEM), 4 Noxious Weeds (90.1%) | 3 Wetlands (PEM), 4 Noxious Weeds (90.1%) | 3 Wetlands (PEM), 4 Noxious Weeds (90.1%) |
| **Construction Costs** | | | | | |
| Cost per mile | $2,100,000 | $2,050,000 | $2,100,000 | $2,100,000 | $2,100,000 |
| Total Construction Cost | $64,407,000 | $63,550,000 | $65,310,000 | $65,163,000 | $65,184,000 |
| Environmental Mitigation Cost | $2,960 | $2,880 | $2,880 | $2,880 | $2,880 |

* The 2010 proposed route includes KEY-26, KEY-27, and KEY-28.

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-6a Route Variation MTV-6a (McCone/Dawson County Variation A)

MTV-6a (see Figure I-2.4.2-7 and Table I-2.4.2-6) would differ from MTV-6 between approximately milepost 144 to milepost 145 on private land, to move farther from a residence. Variation 6a would be about 0.1 mile longer than MTV-6 in this area.

MTV-6a would cross 0.55 mile more developed land, eight more minor roads, no railroads, would not be within 100 feet of water wells, and would be within 500 feet of three fewer structures than the equivalent parallel portion of the 2010 proposed route. MTV-6a would cross about 7.95 miles more of state land while being about 0.43 mile longer than the equivalent portion of the 2010 proposed route. Surveys found that the variation would cross five fewer eligible cultural resources. MTV-6a would cross seven fewer intermittent streams and 11 fewer USGS streams. Biological surveys found that the variation would cross two fewer PEM wetlands and five fewer noxious weed areas. MTV-6a was selected by MDEQ in conjunction with MTV-6 to avoid excessive stream crossings, to increase the distance between the pipeline and a house, and to avoid cultural impacts.

### I-2.4.2-6b Route Variation MTV-6b (McCone/Dawson County Variation B)

MTV-6b (see Figure I-2.4.2-7 and Table I-2.4.2-6) would divert from MTV-6 at a MDEQ proposed crossing at Redwater River at milepost 146, and would rejoin MTV-6 at approximately milepost 147. MTV-6b would avoid a tall steep bank on the south side of the Redwater River that would be traversed by MTV-6. This variation would be less than 0.03 mile longer than MTV-6. The comparison of MTV-6b to the 2010 proposed route segment is essentially the same as that of MTV-6. MTV-6b was selected by MDEQ, in conjunction with MTV-6, to avoid the construction difficulties associated with the cliff on the south side of the Redwater River.

### 1-2.4.2-6c Route Variation MTV-6c (McCone/Dawson County Variation C)

MTV-6c (see Figure I-2.4.2-7 and Table I-2.4.2-6) would divert from MTV-6 near milepost 149 and rejoin MTV-6 near milepost 150. The adjustment would allow for relocation of pump station 12 on private land and for a different crossing of Gyp Creek. MTV-6c is about 0.04 mile longer than the equivalent segment of MTV-6, and would cross about 0.14 mile less state land, 14 fewer minor roads, and one less USGS stream.

When MTV-6 is combined with MTV-6c and compared to the portion of the 2010 proposed route segment, the biggest difference is that MTV-6 and 6c would cross 7.8 miles more state land, would cross 3.56 miles fewer hay land, and would cross 18 fewer streams. MTV-6c was selected by MDEQ in conjunction with MTV-6, to provide a better approach to the revised location for the proposed pump station 12.

### I-2.4.2-7 Route Variation MTV-7 (Lone Tree Creek Variation)

MTV-7 (see Figure I-2.4.2-7 and Table I-2.4.2-7) was developed in response to a landowner request to avoid construction near a residence that would be about 550 feet from the edge of the construction ROW. Because the residence would be more than 500 feet from the edge of the proposed construction ROW, it was not listed in Table I-2.4.2-7. MTV-7 would connect to KEY-26 on the 2010 proposed route. MTV-7 would be about 0.1 mile longer than the 2010 proposed route segment it would replace. As shown in Figure I-2.5-7, the objectives of this landowner request would also be met by MTV-6, MTV-6a, MTV-6b, or MTV-6c.

Both routes would cross an intermittent stream but the 2010 proposed route segment would cross two additional USGS streams.  In addition, the land cover database used for Table I-2.4.2-7 indicated that there was about 0.1 mile of wetland along the MTV-7 route and that there were no wetlands along the 2010 proposed route segment that it would replace.  Therefore, that information was presented in the table, which lists wetland information only from that database for consistency in the comparisons.  A Class III survey was not conducted for this variation.  Class I research indicated that there were five cultural resources in the TSR data.

Due to the greater length of the variation, the total cost of construction of the variation would be greater than that of the 2010 proposed route segment.

Both MTV-6 and MTV-7 would be farther from the residence than the 2010 proposed route segment they would replace.  Since MTV-6 is selected as the preferred route, MDEQ did not select either MTV-7 or the proposed route segment it would replace because of the reasons provided in MTV-6 (see Section I-2.4.2-6).

**TABLE I-2.4.2-7**
**Comparison of Montana Route Variation 7 (MTV-7) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | 2010 Proposed Route Segment | MTV-7 | Difference | Item | 2010 Proposed Route Segment | MTV-7 | Difference |
|---|---|---|---|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | | | Miles of Land Crossed (except where noted) | | |
| **Length** | 1.7 | 1.8 | -0.1 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.25 | 0.20 | +0.05 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 1.41 | 1.50 | -0.09 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.04 | 0.10 | -0.06 |
| Wetlands | 0.0 | 0.1 | -0.1 | > 30% | 0.0 | 0.0 | 0.0 |
| Total | 0.0 | 0.1 | -0.1 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.1 | 0.1 | 0.0 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.6 | 1.7 | -0.1 | **Structures** | | | |
| Total | 1.7 | 1.8 | -0.1 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.0 | 0.0 | 0.0 | **Cultural Resources (Class I)** | | | |
| Private Land | 1.7 | 1.8 | -0.1 | Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| U.S. Bureau of Land Management | 0.0 | 0.0 | 0.0 | Cultural Resources in TRS | 5 | 5 | 0 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.7 | 1.8 | -0.1 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 6 | 4 | +2 | Cost per mile | $2,100,000 | $2,070,000 | |
| Total | 7 | 5 | +2 | Total Construction Cost | $3,570,000 | $3,726,000 | -$156,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### Montana Variations 8 through 10 in the area West and South of Lindsay, Montana

Prior to release of the draft EIS, MDEQ developed MTV-8 and MTV-9 to better use or maximize the use of public lands, so that an alternative was available to make the finding required under MFSA before a certificate of compliance could be issued. This finding requires "that the use of public lands for location of the facility was evaluated and public lands were selected whenever their use is as economically practicable as the use of private lands" (75-30-301(1)(h), MCA). MTV-10 was developed to avoid construction through a small reservoir.

After the draft EIS was circulated for public comments, area landowners suggested seven routing variations that would address individual concerns in this area. MDEQ staff met with area landowners on July 20, 2010, and five more routing variations were suggested. One additional variation was suggested at that time but later withdrawn because of concerns over cultural resources known to area residents. It is possible that some of the routing variations could be used singly or in combination with each other and portions of Keystone's proposed alignment.

These variations were suggested as ways to limit potential adverse impacts by avoiding:

- Productive cropland where alterations of soil characteristics might adversely affect production;
- Wells or springs where water supplies might be disrupted as a result of construction or operation;
- Residences;
- Steep topography that would make construction challenging or increase the potential for soil erosion;
- Private property;
- Downstream fish ponds; and
- Construction through a reservoir.

During the July 20, 2010 meeting and subsequent weeks when additional comments were sought from area landowners, it became clear that there was no community consensus about a route through the area.

Subsequently, more resource information was developed and evaluated. MDEQ staff reviewed the comments and potential impacts and reduced the number of possible routing variations carried forward for detailed consideration. The detailed analysis focused on those variations that would balance the required findings that the selected alternative minimized impacts, considering the state of available technology and cost, with the requirement to use public lands when their use was as economically practicable as the use of private lands.

The first segment not carried forward for further consideration was the portion of MTV-8 that would cross nearly vertical valley walls of an unnamed drainage west of milepost 178. This segment would result in greater construction disturbance and lead to greater challenges in reclaiming the disturbed areas than routing the pipeline farther east on the alternative portion of segment MTV-9. While MTV-8 would avoid being within 100 feet of a water well on MTV-9, MTV-8 was not supported by the affected landowner because construction would disrupt views of a deeply incised drainage from their house.

MTV-9a was suggested by a landowner in an attempt to increase local acceptance of a pipeline route. MTV-9a was not carried forward for further consideration because it would not maximize the use of public lands compared to other variations available. When used with Keystone's 2009 alignment, it would cross Clear Creek twice. Depending upon the routing segments used, this variation would avoid using 1.18 to 1.25 miles of state land located south of approximately milepost 179.9. Clear Creek is an intermittent stream located in a fairly wide flat valley. Aerial photos indicate that the creek has a meandering pattern, indicating past channel movement, and MDEQ staff did not think it appropriate to cross this drainage any more often than necessary.

MTV-9h was suggested by a landowner to avoid crossing dry cropland at the west end of MTV-9a. MTV-9h would instead be routed though irrigated land and like MTV-9a would cross Clear Creek twice. MDEQ did not carry MTV-9h forward because of the crossing of irrigated land and two crossings of Clear Creek.

MTV-9i was suggested by a landowner to avoid being in the vicinity of two private fish ponds. MTV-9i was not carried forward for further consideration because it would avoid using 1.18 to 1.25 miles of state land farther to the south.

MTV-9k and MTV-9c were not carried forward because they would avoid using approximately 1.18 to 1.25 miles of state land farther to the south. Similarly, segment MTV-9d, located south of segment MTV-9l, was not carried forward because it did not maximize the use of public land.

Although MTV-9l, located northwest of segment MTV-9e, would cross two fewer intermittent stream channels than the corresponding segment of MTV-9e, MTV-9l was not carried forward because it did not maximize the use of public land.

The segments not carried forward for detailed consideration are depicted in Figure I-2.4.2-8a.

Figure I-2.4.2-8b depicts the Montana variations carried forward for detailed consideration and the following sections describe the advantages and disadvantages of the remaining variations between milepost 165.5 and 189. Table I-2.4.2-9 provides more precise metrics for these remaining variations.

### I-2.4.2-9 Route Variation MTV-9 (Clear Creek Variation 9)

MTV-9 (Figure I-2.4.2-8b and Table I-2.4.2-9) was developed in response to a request by a landowner to avoid a stream crossing in the viewshed of a residence and to move the pipeline out of the central portion of a field. It also would extend from near milepost 165.6 to milepost 189, and the majority of this 24.5-mile-long variation would be along the same route as MTV-8 (see Figure I-2.4.2-8a). MTV-9 would deviate slightly from the MTV-8 route in the area between mileposts 177 and 179 of the 2010 proposed route segment. MTV-9 would be about 1.06 miles longer and would cross 5.56 more miles of state land than the 2010 proposed route segment it would replace. Like other route variations in the vicinity of Lindsay, it would not cross BLM land.

As with MTV-8, MTV-9 would cross 0.12 mile less of developed land, one less minor road, and would be more than 500 feet away from eight structures than the 2010 proposed route segment. Field surveys identified one non-eligible cultural resource on MTV-9, and no paleontological sites for either route.

MTV-9 would cross 0.01 mile more of NLCD wetlands. Both routes would cross eight intermittent streams but the 2010 proposed route would cross 12 additional USGS streams. A biological survey found that the variation would cross two fewer PEM wetlands and five fewer noxious weed areas.

The increased costs associated with construction across one more minor road for the 2010 proposed route segment would be offset by the increased costs for MTV-9 associated with the greater pipeline length to be constructed along moderate slopes. As a result, the estimated construction cost per mile would be the same for each option. However, because of the longer distance, MTV-9 would be $2,226,000 more expensive to construct than the 2010 proposed route segment, assuming a cost of $2.1 million per mile.

MDEQ selected MTV-9 in place of the proposed route segment as part of the tentatively preferred route in the draft EIS. Since publication of the draft EIS, additional survey information has become available and is presented here as MTV-9. Keystone opposes MTV-9 and does not believe it satisfies the MFSA findings required for certification under 75-20-301 MCA or the preferred location criteria of Circular MFSA-2. They believe that the variation does not improve minimizing impacts (Circular MFSA-2 75-20-301(1)(c) MCA) nor is it economically practicable to the proposed route segment (75-20-301(1)(h) MCA). However, MTV-9 better uses public (state) land than does the 2010 proposed route, allowing MDEQ to make the finding required under 75-20-301(1). Keystone also does not believe that MTV-9 has the greatest potential for general local acceptance (Circular MFSA-2 3.1(1) (a)).

No landowner consensus has been reached about the route through the area; several variations to MTV-9 have been proposed through public comments and landowner meetings, and carried forward by MDEQ, which are presented as MTV-9b through MTV-9m in Table I-2.4.2-9 and Figure I-2.4.2-8b. MTV-9 variations begin at approximately milepost 165.5 and end approximately at milepost 189. In consideration of the greater length and slight increase in impacts, MTV-9 was not selected by MDEQ.

**TABLE I-2.4.2-9**
**Comparison of Montana Route Variations 9a-m (MTV-9a-m with the Proposed Segment of the 2010 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Item** | **2010 Proposed Route Segment** | **MTV-9** | **MTV-9b** | **MTV-9e** | **MTV-9f** | **MTV-9g** | **MTV-9j** | **MTV-9m** |
| **Length** | 23.42 | 24.48 | 23.44 | 24.52 | 23.62 | 23.46 | 24.99 | 24.57 |
| **Land Cover** | | | | | | | | |
| Developed | 0.91 | 0.79 | 0.91 | 0.79 | 0.67 | 0.91 | 0.99 | 0.78 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | 0.09 | 0.02 | 0.00 | 0.00 | 0.09 |
| Wetlands | 0.19 | 0.20 | 0.18 | 0.21 | 0.19 | 0.42 | 0.21 | 0.22 |
| Total | 1.10 | 0.99 | 1.09 | 1.09 | 0.88 | 1.33 | 1.20 | 1.09 |
| **Revenue Final Land Unit Classification** | | | | | | | | |
| Range Land | 9.18 | 12.72 | 9.79 | 13.04 | 11.16 | 9.24 | 12.99 | 14.58 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hay Land | 14.24 | 11.76 | 13.65 | 11.48 | 12.46 | 14.22 | 12.00 | 9.99 |
| Total | 23.42 | 24.48 | 23.44 | 24.52 | 23.62 | 23.46 | 24.99 | 24.57 |
| **Land Ownership** | | | | | | | | |
| State of Montana | 0.11 | 5.67 | 0.67 | 6.02 | 2.66 | 0.11 | 3.35 | 5.99 |
| Private Land | 23.31 | 18.81 | 22.77 | 18.50 | 20.96 | 23.35 | 21.64 | 18.58 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 23.42 | 24.48 | 23.44 | 24.52 | 23.62 | 23.46 | 24.99 | 24.57 |
| **Number of Road Crossings** | | | | | | | | |
| Major Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Minor Roads | 21 | 20 | 21 | 20 | 20 | 21 | 20 | 20 |
| Total | 21 | 20 | 21 | 20 | 20 | 21 | 20 | 20 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | | | | | |
| Perennial Streams | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Intermittent Streams | 8 | 8 | 9 | 8 | 7 | 8 | 7 | 8 |
| Additional USGS Streams | 28 | 16 | 29 | 19 | 24 | 28 | 29 | 27 |
| Total | 36 | 24 | 38 | 27 | 31 | 36 | 36 | 35 |
| **Slope** | | | | | | | | |
| < 5% | 9.13 | 9.79 | 9.35 | 9.56 | 8.49 | 9.30 | 9.51 | 9.00 |
| ≥ 5% and ≤ 15% | 12.89 | 13.66 | 12.66 | 13.71 | 13.69 | 12.71 | 13.88 | 14.17 |
| > 15% and ≤ 30% | 1.38 | 0.92 | 1.41 | 1.14 | 1.44 | 1.43 | 1.49 | 1.31 |
| > 30% | 0.02 | 0.11 | 0.02 | 0.11 | 0.00 | 0.02 | 0.11 | 0.09 |
| **Water Wells within 100 ft** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Residences** | | | | | | | | |
| Residences within 25 ft | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**TABLE I-2.4.2-9**
**Comparison of Montana Route Variations 9a-m (MTV-9a-m with the Proposed Segment of the 2010 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Item | 2010 Proposed Route Segment | MTV-9 | MTV-9b | MTV-9e | MTV-9f | MTV-9g | MTV-9j | MTV-9m |
| **Structures** | | | | | | | | |
| Structures within 25 ft | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structures within 500 ft | 8 | 0 | 8 | 0 | 7 | 8 | 4 | 0 |
| **Cultural Resources (Class III)** | | | | | | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 1 Not Elg. (68%) | 0 (88%) | 1 Not Elg. (68%) | 0 (60%) | 0 (97%) | 0 (63%) | 1 Not Elg. (68%) |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (68%) | 0 (88%) | 0 (68%) | 0 (60%) | 0 (97%) | 0 (63%) | 0 (68%) |
| **Grouse (desktop data)** | | | | | | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sharp-tailed Leks within 2 miles | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Sharp-tailed Leks within 3 miles | 6 | 4 | 6 | 4 | 5 | 6 | 5 | 4 |
| Sharp-tailed Leks within 4 miles | 8 | 7 | 7 | 7 | 6 | 8 | 6 | 7 |
| **Biology (survey data)** | | | | | | | | |
| Biological Resources (%Surveyed) | 5 Wetlands (PEM), 9 Noxious Weeds (100%) | 3 Wetlands (PEM), 4 Noxious Weeds (90.1%) | N/A | N/A | N/A | N/A | N/A | N/A |
| **Construction Costs** | | | | | | | | |
| Cost per mile | $2,100,000 | $2,100,000 | $2,100,000 | $2,100,000 | $2,100,000 | $2,100,000 | $2,100,000 | $2,100,000 |
| Total Construction Cost | $49,182,000 | $51,408,000 | $49,224,000 | $51,492,000 | $49,602,000 | $49,266,000 | $52,479,000 | $51,597,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-9b Route Variation MTV-9b (Clear Creek Variation B)

MTV-9b (Figure I-2.4.2-8b and Table I-2.4.2-9) was a variation suggested by MDEQ to avoid irrigation dikes. It would deviate from the proposed route at approximately milepost 173 and reconnect at approximately milepost 176. This variation would be 0.02 mile longer than the 2010 proposed route and cross 0.56 mile more of state land. The variation would cross 0.01 mile less NLCD wetlands, one more intermittent stream, one more USGS stream, and would have one less sharp-tailed grouse lek within 4 miles. MTV-9b was not selected because it failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

### I-2.4.2-9e Route Variation MTV-9e (Clear Creek Variation E)

MTV-9e (Figure I-2.4.2-8b and Table I-2.4.2-9) would follow the route of MTV-9, except west of milepost 180 to milepost 182 where it would move 1,100 feet east for approximately 2.3 miles, at a landowner’s request to avoid farmland in Section 21, Township 15 North, Range 52 East. MTV-9e would be 1.1 miles longer than the 2010 proposed route and cross 5.91 miles more of state land. MTV-9e would cross 0.12 mile less developed land and would not be within 500 feet of any structures, unlike the proposed segment which would be within 500 feet of eight structures. Surveys found that the variation could cross one non-eligible cultural resource. Neither route would affect any paleontological sites. The variation would cross 0.09 mile of forested/woodlands, 0.02 mile more of NLCD wetlands, nine fewer USGS streams, and would be within 4 miles of one fewer sharp-tailed grouse lek. The southern 1.5 miles of MTV-9e was selected by MDEQ because it made better use of state-owned land.

### I-2.4.2-9f Route Variation MTV-9f (Clear Creek Variation F)

MTV-9f (Figure I-2.4.2-8b and Table I-2.4.2-9) would leave the 2010 proposed route at milepost 180 and connect to MTV-9d for the remainder of the variation, which would avoid more cultivated land than the 2010 proposed route. This variation would be 0.20 mile longer than the 2010 proposed route segment and cross 2.55 miles more of state land. The variation would cross 0.24 mile less developed land, one less minor road, and would be within 500 feet of one less structure. Surveys found that the variation would not cross cultural resources. Neither route would affect any paleontological sites. The variation would cross 0.02 mile more forested/woodlands, one less intermittent stream and four fewer USGS streams, and two fewer sharp-tailed grouse lek would be within 4 miles. MTV-9f was not selected because it is longer, and failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

### I-2.4.2-9g Route Variation MTV-9g (Clear Creek Variation G)

MTV-9g (Figure I-2.4.2-8b and Table I-2.4.2-9) was proposed as a new crossing of Clear Creek at milepost 175 to avoid a developed spring identified by the landowner. This variation would be 0.04 mile longer than the 2010 proposed route segment. MTV-9g and the 2010 proposed route segment would cross 0.91 mile of developed land. MTV-9g would cross 0.23 mile more NLCD wetlands and both the variation and proposed route segment would cross eight intermittent streams and 28 USGS streams. In addition, for both routes, field surveys identified subirrigated hay land, or lands irrigated with spreader dikes, and a small fringe wetland. A deep pool was also identified at the crossing for the 2010 proposed route. MTV-9g was selected by MDEQ because it avoided a developed spring and deep pool that was crossed by the 2010 proposed route.

### I-2.4.2-9j Route Variation MTV-9j (Clear Creek Variation J)

MTV-9j (Figure I-2.4.2-8b and Table I-2.4.2-9) was a landowner suggested variation that would connect to the 2010 proposed route at milepost 179. The variation was suggested by the landowner to avoid the general vicinity of two fish ponds. The pipeline alternatives range in distance from approximately 0.25 mile to 0.5 mile away. This variation would be 1.57 miles longer than the proposed route and would cross 3.24 miles more of state land. MTV-9j would cross 0.08 mile more developed land and would be within 500 feet of four less structures. Surveys found that the variation would not cross cultural resources. Neither route would affect any paleontological sites. The variation would cross 0.02 mile more of NLCD wetlands and one additional USGS stream, but one less intermittent stream and two fewer sharp-tailed grouse leks would be within 4 miles. MTV-9j was not selected because of greater construction costs, increased length resulting in slightly greater impacts, and it failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

#### I-2.4.2-9m Route Variation MTV-9m (Clear Creek Variation M)

MTV-9m (Figure I-2.4.2-8b and Table I-2.4.2-9) would follow the same route as MTV-9e to Section 22, Township 15 North, Range 53 East, where it would then follow MTV-9f to avoid cropland and pick up more rangeland. MTV-9m would be 1.15 miles longer than the 2010 proposed route and cross 5.88 more miles of state land. MTV-9m would cross 0.13 mile less of developed land and would be within 500 feet of any structures. Surveys found that the variation could cross one non-eligible cultural resource. Neither route would affect any paleontological sites. The variation would cross 0.03 mile more of NLCD wetlands and 0.09 mile more of forested/woodlands, but one fewer sharp-tailed grouse lek would be within 4 miles, and one less USGS identified stream would be crossed. MTV-9m was not selected because of greater construction costs, increased length resulting in slightly greater impacts, and it failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

#### I-2.4.2-10 Route Variation MTV-10 (Clear Creek Tributary Variation)

MTV-10 (Figure I-2.4.2-8b and Table I-2.4.2-10) was developed in response to a request by a landowner to avoid a stock pond. MTV-10 would be about 0.01 mile longer than the 2010 route segment it would replace. The stock pond would also be avoided with implementation of MTV-8 or MTV-9 (see Sections I-2.4.2-8 and I-2.4.2-9). Table I-2.4.2-10 presents a comparison of key environmental characteristics and other data associated with MTV-10, to those of the 2010 route segment.

Although the estimated construction cost per mile is the same for each of the options, the estimated total construction cost of the variation is greater than that of the 2010 route segment because of its greater length. Neither MTV-10 or the 2010 proposed route would cross BLM-administered or state-owned lands. In order to satisfy the landowner’s request to avoid a stock pond, MDEQ has selected MTV-10 in conjunction with MTV-9g.

**TABLE I-2.4.2-10**
**Comparison of Montana Route Variation 10 (MTV-10) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-10 | Difference | Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-10 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.47 | 1.48 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.27 | 0.27 | 0.00 |
| Developed | 0.07 | 0.05 | +0.02 | ≥ 5% and ≤ 15% | 0.93 | 0.99 | -0.06 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.27 | 0.22 | +0.05 |
| Wetlands | 0.0 | 0.0 | 0.0 | > 30% | 0.0 | 0.0 | 0.0 |
| Total | 0.07 | 0.05 | +0.02 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.80 | 0.65 | +0.15 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.67 | 0.83 | -0.16 | **Structures** | | | |
| Total | 1.47 | 1.48 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.0 | 0.0 | 0.0 | **Cultural Resources (Class I)** | | | |
| Private Land | 1.47 | 1.48 | -0.01 | Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| U.S. Bureau of Land Management | 0.0 | 0.0 | 0.0 | Cultural Resources in TRS | 3 | 3 | 0 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.47 | 1.48 | -0.01 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 2 | 2 | 0 | Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 2 | 2 | 0 | Cost per mile | $1,900,000 | $1,900,000 | |
| Total | 2 | 2 | 0 | Total Construction Cost | $2,793,000 | $2,812,000 | -$19,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of difference.

### I-2.4.2-11 Route Variation MTV-11 (Cabin Creek Variation)

MTV-11 (Figure I-2.4.2-9 and Table I-2.4.2-11) was developed in response to a request by a landowner to avoid the Cabin Creek stream crossing and a crossing of land irrigated using spreader dikes. MTV-11 is also described as KEY-33 and KEY-34 in the 2010 proposed route and is compared to the 2009 proposed route in this section. The variation would be about 0.1 mile shorter than the 2009 proposed route segment it would replace.

Neither the variation nor the 2009 route segment would cross public land. The Revenue Final Land Unit Classification database used to obtain the data presented in Table I-2.4.2-11 did not list irrigated land along the 2009 proposed route segment or MTV-11. That database was used for consistency in the comparisons. However, the landowner indicated that the 2009 proposed route would cross irrigated land, and this was evident during subsequent review of recent aerial photographs.

The variation would cross 0.02 mile more developed land and three more minor roads. It would not be within 500 feet of a structure, unlike the 2009 proposed route segment. Surveys found that the variation would not affect any cultural resources, but would affect one more non-significant paleontological site. The variation would cross 0.13 mile less forested/woodland areas and 0.04 mile less NLCD wetlands, one less perennial stream, but one more USGS stream than the 2009 proposed route segment. Surveys found that MTV-11 would cross five noxious weed areas, whereas the 2009 route segment would not cross any.

The irrigated land on the proposed route (not listed in Table I-2.4.2-11 as described above) may require more costly reclamation than non-irrigated land. However, MTV-11 would extend along a greater distance of moderate to steeply sloped areas and cross three more minor roads than the 2009 route segment. Therefore, the estimated cost of construction per mile for MTV-11 would be greater than that of the 2009 proposed route segment. However, due to the greater length of the 2009 proposed route, it was estimated that total cost would be greater than that of the variation.

Because MTV-11 would meet the request of the landowner and would not cross irrigated land and a stream, MDEQ selected MTV-11. Keystone's evaluation of MTV-11 indicated that it was a reasonable variation to the 2009 proposed route, which has been included as KEY-33 and KEY-34 in the 2010 proposed route.

# TABLE I-2.4.2-11
## Comparison of Montana Route Variation 11 (MTV-11) with the Proposed Segment of the 2009 Route it Would Replace

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2009 Proposed Route Segment | MTV-11 | Difference |
| **Length** | 3.58 | 3.48 | +0.10 |
| **Land Cover** | | | |
| Developed | 0.08 | 0.10 | -0.02 |
| Forested/ Woodlands | 0.21 | 0.08 | +0.13 |
| Wetlands | 0.04 | 0.00 | +0.04 |
| Total | 0.33 | 0.18 | +0.15 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.34 | 2.03 | -0.69 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 2.24 | 1.45 | +0.79 |
| Total | 3.58 | 3.48 | -0.10 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 3.58 | 3.48 | +0.10 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 3.58 | 3.48 | +0.10 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 4 | 7 | -3 |
| Total | 4 | 7 | -3 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 0 | +1 |
| Intermittent Streams | 1 | 1 | 0 |
| Additional USGS Streams | 0 | 1 | -1 |
| Total | 2 | 2 | 0 |

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2009 Proposed Route Segment | MTV-11 | Difference |
| **Slope** | | | |
| < 5% | 1.81 | 1.31 | +0.50 |
| ≥ 5% and ≤ 15% | 1.77 | 1.94 | -0.17 |
| > 15% and ≤ 30% | 0.00 | 0.23 | -0.23 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 1 | 0 | +1 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 1 Not Sig. (100%) | -1 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 0 (100%) | 5 Noxious Weeds (100%) | -5 Noxious Weeds |
| **Construction Costs** | | | |
| Cost per mile | $1,900,000 | $1,940,000 | |
| Total Construction Cost | $6,840,000 | $6,790,000 | +$50,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-12 Route Variation MTV-12 (Spring Creek Variation)

MTV-12 (Figure I-2.4.2-10 and Table I-2.4.2-12) was developed to address a landowner's request to avoid crossing the central portion of a field. As shown on Figure I-2.4.2-10, MTV-12 would cross the field farther west than the 2010 proposed route. The variation would be 0.05 mile longer than the 2010 route segment it would replace, and neither the variation nor the 2010 route segment would cross irrigated land.

Since construction and reclamation across the field would be similar for each route, the estimated construction cost per mile would be similar for each of the two options. However, as indicated on Figure I-2.5-10, MTV-12 would likely require construction through a drainage area and that would slightly increase the actual cost of construction. In addition, the estimated total cost of the variation would be greater than that of the 2010 route segment because of its greater length.

If implemented, this variation would likely cross the heads of draws and result in greater impacts than the 2010 proposed route segment. As result, MDEQ did not select MTV-12.

### I-2.4.2-13 Route Variation MTV-13 (Dry Fork Creek Variation)

MTV-13 (Figure I-2.4.2-11 and Table I-2.4.2-13) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route. The 2010 proposed route segment includes KEY-36 through KEY-39. MTV-13 would be about 1.2 miles longer than the 2010 route segment it would replace and would cross 7.1 fewer miles of private land. However, it would cross 2.1 more miles of state land and 6.2 more miles of BLM land than the route segment. There would be 3.0 miles less hay land along the variation.

MTV-13 would cross two fewer minor roads, would not be within 500 feet of two residences and five structures, or within 100 feet of an additional water well. A Class III field survey was not conducted for this variation. Class I research indicated that there are two cultural resources in the TRS data. The variation would cross 0.01 mile less of forested/woodland areas and 0.2 mile less of wetlands. MTV-13 would cross one less intermittent stream than the proposed route segment but 10 additional USGS streams. More known greater sage-grouse leks and sharp-tailed grouse leks would be located closer to MTV-13 than the 2010 proposed route.

Because MTV-13 would extend through a greater distance of moderate to steeply sloped areas than the 2010 proposed route segment, the greater cost of construction through those areas would only partially offset the greater cost of constructing the route segment through the areas noted above. As a result, the estimated construction cost per mile of the 2010 proposed route segment would be greater than that of MTV-13.

Because of the concern about potential effects to greater sage-grouse habitat, MDEQ did not select MTV-13 in place of the proposed route segment.

**TABLE I-2.4.2-12**

**Comparison of Montana Route Variation 12 (MTV-12) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-12 | Difference |
|---|---|---|---|
| **Length** | 0.88 | 0.93 | -0.05 |
| **Land Cover** | | | |
| Developed | 0.02 | 0.02 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.04 | -0.04 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.02 | 0.06 | -0.04 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 0.88 | 0.93 | -0.05 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 0.88 | 0.93 | -0.05 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 0.88 | 0.93 | -0.05 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 0.88 | 0.93 | -0.05 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 |
| Total | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-12 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 0.47 | 0.43 | +0.04 |
| ≥ 5% and ≤ 15% | 0.41 | 0.50 | -0.09 |
| > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class I)** | | | |
| Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| Cultural Resources in TRS | 2 | 2 | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $1,900,000 | $1,900,000 | |
| Total Construction Cost | $1, 672,000 | $1,767,000 | -$95,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-13**
**Comparison of Montana Route Variation 13 (MTV-13) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | Miles of Land Crossed (except where noted) MTV-13 | Difference | Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | Miles of Land Crossed (except where noted) MTV-13 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 18.8 | 20.0 | -1.2 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 5.47 | 3.97 | +1.50 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 11.72 | 13.87 | -2.15 |
| Forested/ Woodlands | 0.1 | 0.0 | +0.1 | > 15% and ≤ 30% | 1.64 | 2.11 | -0.47 |
| Wetlands | 0.3 | 0.1 | +0.2 | > 30% | 0.00 | 0.01 | -0.01 |
| Total | 0.4 | 0.1 | +0.3 | **Water Wells within 100 ft** | 2 | 1 | +1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 10.8 | 15.0 | -4.2 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 2 | 0 | +2 |
| Hay Land | 8.0 | 5.0 | +3.0 | **Structures** | | | |
| Total | 18.8 | 20.0 | -1.2 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 5 | 0 | +5 |
| State of Montana | 0.1 | 2.2 | -2.1 | **Cultural Resources (Class I)** | | | |
| Private Land | 17.4 | 10.3 | +7.1 | Cultural Resources in 300-ft APE | 1 | 0 | +1 |
| U.S. Bureau of Land Management | 1.3 | 7.5 | -6.2 | Cultural Resources in TRS | 35 | 39 | -4 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 18.8 | 20.0 | -1.2 | Sage-grouse Leks within 1 mile | 0 | 2 | -2 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 2 | 3 | -1 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 5 | 4 | +1 |
| Minor Roads | 16 | 14 | +2 | Sage-grouse Leks within 4 miles | 7 | 7 | 0 |
| Total | 16 | 14 | +2 | Sharp-tailed Leks within 1 mile | 1 | 0 | +1 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 1 | 3 | -2 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 2 | 6 | -4 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 6 | 7 | -1 |
| Intermittent Streams | 10 | 9 | +1 | **Construction Costs** | | | |
| Additional USGS Streams | 11 | 21 | -10 | Cost per mile | $1,900,000 | $1,880,000 | |
| Total | 21 | 30 | -9 | Total Construction Cost | $35,720,000 | $37,600,000 | -$1,880,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-14 Route Variation MTV-14 (Sandstone Creek Variation)

MTV-14 (Figure I-2.4.2-12 and Table I-2.4.2-14) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route. MTV-14 would be about 0.1 mile longer than the 2010 proposed route segment and would cross about 0.5 mile less private land and 0.2 mile less BLM land, but would cross 0.8 mile more state land. It also would parallel an existing pipeline.

MTV-14 would cross four more minor roads, two more cultural resources in the TRS, and would be within 500 feet of one structure, compared to no structures for the 2010 route segment. It would cross 0.1 mile less NLCD wetlands, and eight fewer intermittent streams and three fewer USGS streams than the 2010 route segment. The cost of construction across a larger number of roadway crossings along MTV-14 would be offset by the decreased number of stream and wetland crossings, and the greater distance along moderately sloped areas of the proposed route segment. As a result, the estimated cost of construction per mile would be the same for both options.

However, the variation also would be closer to greater sage-grouse habitat and one additional greater sage-grouse lek. Because of concern about the potential effects to greater sage-grouse habitat and the additional structure, MDEQ did not select MTV-14 in place of the proposed route segment.

### I-2.4.2-15 Route Variation MTV-15 (Red Butte Creek Variation)

MTV-15 (Figure I-2.4.2-12 and Table I-2.4.2-15) was developed in response to a request by a landowner to avoid construction in the vicinity of two residences and a water well. The residence nearest the 2010 proposed route segment would be approximately 600 feet from the edge of the construction ROW and, therefore, the residences are not listed in Table I-2.4.2-15. The variation would be about 0.02 mile shorter than the 2010 proposed route segment, on private land, but would be located approximately 1,600 feet west of the nearest of the two residences. This landowner request would also be addressed by MTV-14, which would be farther from the residences than MTV-15 (see Section I-2.4.2-14 and Figure I-2.4.2-12).

MTV-15 would cross 0.03 mile less developed land but two more minor roads. Surveys did not find any cultural or paleontological resources for either route. The variation would not cross wetlands or eight intermittent streams, but would cross three additional USGS streams. Two greater sage-grouse leks were identified within 4 miles of both routes using desktop data, and field surveys confirmed that there was only one lek within 3 miles of each route.

Implementation of MTV-15 would meet the objective of the landowner by moving the pipeline farther from the two residences. It would also result in fewer stream crossings and slightly less distance of wetlands crossed, as compared to the 2010 proposed route segment. In consideration of this information, MDEQ has selected MTV-15 in place of the proposed route segment.

**TABLE I-2.4.2-14**
**Comparison of Montana Route Variation 14 (MTV-14) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) | | | Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| | 2010 Proposed Route Segment | MTV-14 | Difference | | 2010 Proposed Route Segment | MTV-14 | Difference |
| **Length** | 8.4 | 8.5 | -0.1 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 3.4 | 3.7 | -0.3 |
| Developed | 0.1 | 0.2 | -0.1 | ≥ 5% and ≤ 15% | 4.9 | 4.5 | +0.4 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.1 | 0.3 | -0.2 |
| Wetlands | 0.1 | 0.0 | +0.1 | > 30% | 0.0 | 0.0 | 0.0 |
| Total | 0.2 | 0.2 | 0.0 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 5.3 | 5.2 | +0.1 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 3.1 | 3.3 | -0.2 | **Structures** | | | |
| Total | 8.4 | 8.5 | -0.1 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 1 | -1 |
| State of Montana | 0.0 | 0.8 | -0.8 | **Cultural Resources (Class I)** | | | |
| Private Land | 7.7 | 7.2 | +0.5 | Cultural Resources in 300-ft APE | 1 | 1 | 0 |
| U.S. Bureau of Land Management | 0.7 | 0.5 | +0.2 | Cultural Resources in TRS | 27 | 29 | -2 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 8.4 | 8.5 | -0.1 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 2 | 2 | 0 | Sage-grouse Leks within 3 miles | 1 | 2 | -1 |
| Minor Roads | 5 | 9 | -4 | Sage-grouse Leks within 4 miles | 3 | 3 | 0 |
| Total | 7 | 11 | -4 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 1 | 1 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 9 | 1 | +8 | **Construction Costs** | | | |
| Additional USGS Streams | 6 | 3 | +3 | Cost per mile | $2,000,000 | $2,000,000 | |
| Total | 16 | 5 | +11 | Total Construction Cost | $16,800,000 | $17,000,000 | -$200,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

## TABLE I-2.4.2-15
## Comparison of Montana Route Variation 15 (MTV-15) with the Proposed Segment of the 2010 Route it Would Replace

| | Miles of Land Crossed (except where noted) | | | | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| **Item** | **2010 Proposed Route Segment** | **MTV-15** | **Difference** | **Item** | **2010 Proposed Route Segment** | **MTV-15** | **Difference** |
| **Length** | 3.05 | 2.99 | +0.06 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.97 | 0.75 | +0.22 |
| Developed | 0.04 | 0.05 | -0.01 | ≥ 5% and ≤ 15% | 2.08 | 2.12 | -0.04 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.12 | -0.12 |
| Wetlands | 0.02 | 0.00 | +0.02 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.06 | 0.05 | +0.01 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 2.21 | 2.57 | -0.36 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.84 | 0.42 | +0.42 | **Structures** | | | |
| Total | 3.05 | 2.99 | +0.06 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 3.05 | 2.99 | +0.06 | Cultural Findings (% Surveyed) | 0 (60%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (60%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 3.05 | 2.99 | +0.06 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 1 | 1 | 0 | Sage-grouse Leks within 3 miles | 1 | 1 | 0 |
| Minor Roads | 1 | 3 | -2 | Sage-grouse Leks within 4 miles | 2 | 2 | 0 |
| Total | 2 | 4 | -2 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 8 | 0 | +8 | **Biology (survey data)** | | | |
| Additional USGS Streams | 1 | 4 | -3 | Biological Resources (% Surveyed) | 0 (60%) | 0 (100%) | 0 |
| Total | 9 | 4 | +5 | **Construction Costs** | | | |
| | | | | Cost per mile | $2,000,000 | $1,960,000 | |
| | | | | Total Construction Cost | $6,100,000 | $5,860,400 | +$239,600 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-16 Route Variation MTV-16 (Little Beaver Creek Variation)

MTV-16 (Figure I-2.4.2-13 and Table I-2.4.2-16) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route, which would include KEY-40. MTV-16 would be about 0.5 mile longer than the 2010 route segment but would cross about 1.5 miles less private land. MTV-16 would cross 1.6 miles more state land and 0.4 mile more BLM land than the 2010 route segment.

MTV-16 would cross 0.7 mile more hay land and five more minor roads. A Class III survey was not conducted for this variation. Class I research indicated that there were 16 more cultural resources in the TRS data. The variation would cross 0.1 mile less wetlands, two more intermittent streams, but one less USGS stream. The variation would be closer to four known greater sage-grouse leks. The 2010 proposed route would extend along more moderate to steeply sloped areas. However, there would be greater costs associated with the larger number of road and stream crossings of MTV-16. As a result, the estimated construction cost per mile of the MTV-16 would be greater than that of the route segment.

Because of the concern about potential effects to greater sage-grouse habitat, length, roads, streams, and cultural resources, MDEQ did not select MTV-16 in place of the proposed route segment.

### I-2.4.2-17 Route Variation MTV-17 (Hidden Water Creek Variation)

MTV-17 (Figure I-2.4.2-13 and Table I-2.4.2-17) was developed to increase the amount of public land crossed, in comparison to the 2010 proposed route. MTV-17 would be about 0.23 mile longer than the 2010 route segment it would replace, but would cross about 0.77 mile less of private land.

MTV-17 would cross about 1 mile more of state land than the route segment, and neither route would cross BLM land. It also would cross about 0.15 mile less hay land than the route segment. Surveys did not find any cultural resource or paleontological sites for either route. MTV-17 and the 2010 proposed route segment would cross 0.04 mile of wetlands and one intermittent stream, and the variation would cross one additional USGS stream. Biological field surveys found that MTV-17 would cross one PEM wetland, whereas the 2010 proposed route segment was not found to cross any wetlands. Desktop data indicated that three greater sage-grouse leks were identified within 4 miles of both routes, and field surveys confirmed that there were two leks within 3 miles of each route.

The estimated construction cost per mile of each option would be the same, although the total estimated cost of construction of MTV-17 would be greater than that of the 2010 proposed route segment because of its greater length. Since publication of the draft EIS, additional information became available and is presented here as MTV-17. After analysis, MDEQ selected MTV-17 in place of the proposed route segment because it would cross more public land.

**TABLE I-2.4.2-16**
**Comparison of Montana Route Variation 16 (MTV-16) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-16 | Difference | Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-16 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 7.6 | 8.1 | -0.5 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.7 | 3.0 | -1.3 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 5.1 | 4.7 | +0.4 |
| Forested/ Woodlands | 0.1 | 0.1 | 0.0 | > 15% and ≤ 30% | 0.8 | 0.4 | +0.4 |
| Wetlands | 0.1 | 0.0 | +0.1 | > 30% | 0.0 | 0.0 | 0.0 |
| Total | 0.2 | 0.1 | +0.1 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 6.3 | 6.2 | +0.1 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.2 | 1.9 | -0.7 | **Structures** | | | |
| Total | 7.6 | 8.1 | -0.5 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.7 | 2.3 | -1.6 | **Cultural Resources (Class I)** | | | |
| Private Land | 6.6 | 5.1 | +1.5 | Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| U.S. Bureau of Land Management | 0.3 | 0.7 | -0.4 | Cultural Resources in TRS | 1 | 17 | -16 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 7.6 | 8.1 | -0.5 | Sage-grouse Leks within 1 mile | 0 | 2 | -2 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 2 | 2 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 4 | 6 | -2 |
| Minor Roads | 4 | 9 | -5 | Sage-grouse Leks within 4 miles | 8 | 12 | -4 |
| Total | 4 | 9 | -5 | Sharp-tailed Leks within 1 mile | 0 | 1 | -1 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 1 | 1 | 0 |
| Intermittent Streams | 2 | 4 | -2 | **Construction Costs** | | | |
| Additional USGS Streams | 6 | 5 | +1 | Cost per mile | $2,000,000 | $2,020,000 | |
| Total | 8 | 9 | -1 | Total Construction Cost | $15,200,000 | $16,362,000 | -$1,162,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-17**
**Comparison of Montana Route Variation 17 (MTV-17) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-17 | Difference |
|---|---|---|---|
| **Length** | 1.88 | 2.11 | -0.23 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.04 | 0.04 | 0.00 |
| Total | 0.04 | 0.04 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.50 | 1.88 | -0.38 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.38 | 0.23 | +0.15 |
| Total | 1.88 | 2.11 | -0.23 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 1.00 | -1.00 |
| Private Land | 1.88 | 1.11 | +0.77 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 1.88 | 2.11 | -0.23 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 |
| Total | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 |
| Additional USGS Streams | 0 | 1 | -1 |
| Total | 1 | 2 | -1 |

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-17 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 0.89 | 0.62 | +0.27 |
| ≥ 5% and ≤ 15% | 0.99 | 1.49 | -0.50 |
| > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 1 | 1 | 0 |
| Sage-grouse Leks within 3 miles | 2 | 2 | 0 |
| Sage-grouse Leks within 4 miles | 3 | 3 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 4 miles | 1 | 1 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 0 (100%) | 1 Wetland (PEM) (100%) | -1 Wetland (PEM) |
| **Construction Costs** | | | |
| Cost per mile | $2,000,000 | $2,000,000 | |
| Total Construction Cost | $3,800,000 | $4,200,000 | -$400,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-18 Route Variation MTV-18 (North Fork Coal Bank Creek Variation)

MTV-18 (Figure I-2.4.2-14 and Table I-2.4.2-18) was developed to increase the amount of public land crossed and to reduce the number of stream crossings, in comparison to the 2010 proposed route. MTV-18 would be about 1.1 miles longer and would cross 3.2 miles less private land than the 2010 proposed route segment it would replace. MTV-18 would cross 1.8 miles more state land and 2.5 miles more BLM land, compared to the route segment. MTV-18 would connect to KEY-41 or KEY-46 on the 2010 proposed route.

MTV-18 would cross eight more minor roads but would not be within 500 feet of two structures, compared to the 2010 proposed route segment. A Class III survey was not conducted for this variation. Class I research indicated that there were 15 more cultural resources in the TRS data. The variation would cross three fewer intermittent streams, but three additional USGS streams. It also would be closer to one additional greater sage-grouse lek, one additional sharp-tailed grouse lek, and would extend through more moderate to steeply sloped areas. Therefore, the estimated construction cost per mile of MTV-18 would be greater than that of the 2010 proposed route segment.

While MTV-18 would use 4.3 more miles of public land, there would be few other advantages to justify its added construction cost. Thus, MDEQ did not select MTV-18 in place of the proposed route segment.

### I-2.4.2-19 Route Variation MTV-19 (South Fork Coal Bank Creek Variation)

MTV-19 (Figure I-2.4.2-14 and Table I-2.4.2-19) was developed to avoid a high, unstable valley wall and a tributary at the proposed crossing site of South Fork Coal Bank Creek, which is an intermittent stream. The stream crossing site of MTV-19 would be approximately 1,300 feet east (downstream) of the proposed crossing site, and the variation would be about 0.1 mile longer than the 2009 proposed route segment it would replace. MTV-19 is discussed in more detail in the Montana Stream Crossing Inspections Report for the proposed Project that is on file with MDEQ (see Section I-3.1 for a summary of key information presented in the report). The objective of this variation also would be met by MTV-18 and MTV-19a.

MTV-19 would not connect to KEY-46 on the 2010 proposed route, which is compared as MTV-19a. Neither the variation nor the 2009 route segment would cross public land, and field surveys did not find any cultural resources or paleontological sites on either route. The estimated cost of construction per mile is the same for each option. However, due to its longer distance, the total estimated construction cost of MTV-19 is greater than that of the 2009 route segment.

If implemented, MTV-19 would have avoided an unstable valley wall and would have been environmentally preferable to the proposed crossing of South Fork Coal Bank Creek. However, MDEQ did not select MTV-19 in place of the 2009 proposed route segment, but modified this recommendation as described under MTV-19a in response to landowner comments.

**TABLE I-2.4.2-18**
**Comparison of Montana Route Variation 18 (MTV-18) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) | | | Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| | 2010 Proposed Route Segment | MTV-18 | Difference | | 2010 Proposed Route Segment | MTV-18 | Difference |
| **Length** | 15.3 | 16.4 | -1.1 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 7.2 | 7.1 | +0.1 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 7.1 | 8.4 | -1.3 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.9 | 0.9 | 0.0 |
| Wetlands | 0.0 | 0.0 | 0.0 | > 30% | 0.1 | 0.0 | +0.1 |
| Total | 0.0 | 0.0 | 0.0 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 11.2 | 14.8 | -3.6 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 4.1 | 1.6 | +2.5 | **Structures** | | | |
| Total | 15.3 | 16.4 | -1.1 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 2 | 0 | +2 |
| State of Montana | 0.0 | 1.8 | -1.8 | **Cultural Resources (Class I)** | | | |
| Private Land | 14.8 | 11.6 | +3.2 | Cultural Resources in 300-ft APE | 1 | 1 | 0 |
| U.S. Bureau of Land Management | 0.5 | 3.0 | -2.5 | Cultural Resources in TRS | 11 | 26 | -15 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 15.3 | 16.4 | -1.1 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 1 | -1 |
| Minor Roads | 5 | 13 | -8 | Sage-grouse Leks within 4 miles | 1 | 2 | -1 |
| Total | 5 | 13 | -8 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 1 | -1 |
| Intermittent Streams | 8 | 5 | +3 | **Construction Costs** | | | |
| Additional USGS Streams | 8 | 11 | -3 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 17 | 17 | 0 | Total Construction Cost | $32,130,000 | $34,440,000 | -$2,310,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-19**
**Comparison of Montana Route Variation 19 (MTV-19) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-19 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | MTV-19 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.5 | 0.6 | -0.1 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.37 | 0.27 | +0.10 |
| Developed | 0.0 | 0.0 | 0.0 | ≥ 5% and ≤ 15% | 0.15 | 0.30 | -0.15 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 | > 15% and ≤ 30% | 0.00 | 0.01 | -0.01 |
| Wetlands | 0.0 | 0.0 | 0.0 | > 30% | 0.00 | 0.00 | 0.0 |
| Total | 0.0 | 0.0 | 0.0 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.5 | 0.6 | -0.1 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.0 | 0.0 | 0.0 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.0 | 0.0 | 0.0 | **Structures** | | | |
| Total | 0.5 | 0.6 | -0.1 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.0 | 0.0 | 0.0 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.5 | 0.6 | -0.1 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0. |
| U.S. Bureau of Land Management | 0.0 | 0.0 | 0.0 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.0 | 0.0 | 0.0 | **Grouse (desktop data)** | | | |
| ROW | 0.0 | 0.0 | 0.0 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.5 | 0.6 | -0.1 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Cost per mile | $2,000,000 | $2,000,000 | |
| Total | 1 | 1 | 0 | Total Construction Cost | $1,000,000 | $1,200,000 | -$200,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-19a Route Variation MTV-19a (Boxelder Creek Variation A)

MTV-19a (Figure I-2.4.2-14 and Table I-2.4.2-19a) would extend from milepost 278.2 to milepost 281.7. The variation would be about 0.31 mile longer than the 2010 proposed route segment, which is KEY-46. This variation was proposed by a landowner to avoid more of a cultivated field, buried water lines, and the proximity to their house. The variation would also avoid a vertical bank and connect back to the 2010 proposed pipeline at a gentler angle more suitable for construction.

MTV-19a and the 2010 proposed route segment would cross one perennial stream and one intermittent stream, but the variation would cross one additional USGS identified stream. Field surveys did not find any cultural resources, paleontological sites, wetlands, or noxious weed areas. Desktop data indicated that there was one greater sage-grouse lek within 4 miles of the variation and the 2010 proposed route segment. Field surveys in Harding County, South Dakota identified two additional leks within 3 miles of each of the routes.

After consideration of the potential impacts, MDEQ has selected MTV-19a because the variation would avoid an unstable valley wall and would address landowner concerns for avoiding more of a cultivated field, buried water lines, and proximity to a residence.

### I-2.4.2-20 Route Variation MTV-20 (Cherry Creek Variation)

MTV-20 (Figure I-2.4.2-15 and Table I-2.4.2-20) was suggested in response to multiple landowner comments to move the proposed route farther away from a residential concentration named the Cherry Valley Estates. On the original certificate of survey for Cherry Valley Estates, the purpose of the survey was to subdivide the land into 20-acre lots for sale (Cherry Valley Estates, certificate of survey, 1977). MDEQ worked with existing area landowners to find a location that would address this concern and would better use public land. Keystone also worked with a few of the landowners in the vicinity of MTV-20 and developed KEY-13 and KEY-14 to address some of the landowner concerns about being close to residences. The variation from milepost 65.1 to milepost 72.6 would be 0.58 mile longer than the 2010 proposed route segment it would replace. MTV-20 would cross 1.71 miles more state land and 1.10 mile more BLM land, for a total of about 2.21 fewer miles of private land.

MTV-20 would cross 0.01 mile more developed land, three fewer minor roads, no water wells, and would be more than 500 feet away from two residences and one additional structure. A Class III cultural resources field survey identified one eligible cultural resource for both routes, and one potentially eligible resource and one non-eligible resource additionally for the variation. No paleontological sites were found. MTV-20 would cross 0.26 mile less wetlands, two more intermittent streams, and three additional USGS streams. During biological field surveys, one PEM wetland and one noxious weed area were identified for the 2010 proposed route, which would be avoided by the variation. Desktop data indicated that the variation would be closer to one greater sage-grouse lek, and field surveys confirmed that there was one lek within 3 miles of the variation. Desktop data indicated that both routes would also be within 2 miles of three sharp-tailed grouse leks.

Selection of MTV-20 would allow MDEQ to make the finding required by 75-20-301(1)(h),MCA which requires MDEQ to select the alternative that uses public (state and federal) lands whenever their use would be as economically practicable as the use of private lands. Although MTV-20 would increase costs by about $1,218,000, assuming an average cost per mile of $2.1 million, MDEQ selected MTV-20 rather than the 2010 proposed route to avoid the subdivision, use more public land, and it has a greater potential for local acceptance.

## TABLE I-2.4.2-19a
## Comparison of Montana Route Variation 19a (MTV-19a) with the Proposed Segment of the 2010 Route it Would Replace

| Item | Miles of Land Crossed (except where noted) | | | Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| | KEY-46 | MTV-19a | Difference | | KEY-46 | MTV-19a | Difference |
| **Length** | 3.43 | 3.74 | -0.31 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 2.24 | 2.17 | +0.07 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 1.18 | 1.47 | -0.29 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.01 | 0.10 | -0.09 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.99 | 2.80 | -0.81 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.44 | 0.94 | +0.50 | **Structures** | | | |
| Total | 3.43 | 3.74 | -0.31 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 3.43 | 3.74 | -0.31 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0. |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 3.43 | 3.74 | -0.31 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | **Biology (survey data)** | | | |
| Additional USGS Streams | 1 | 2 | -1 | Biological Resources (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Total | 3 | 4 | -1 | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $7,203,000 | $7,854,000 | -$651,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

## TABLE I-2.4.2-20
## Comparison of Montana Route Variation 20 (MTV-20) with the Proposed Segment of the 2010 Route it Would Replace

| Item | 2010 Proposed Route Segment (Miles of Land Crossed, except where noted) | MTV-20 (Miles of Land Crossed, except where noted) | Difference |
|---|---|---|---|
| **Length** | 7.49 | 8.07 | -0.58 |
| **Land Cover** | | | |
| Developed | 0.11 | 0.12 | -0.01 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.35 | 0.09 | +0.26 |
| Total | 0.46 | 0.21 | +0.25 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 3.78 | 4.27 | -0.49 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 3.71 | 3.80 | -0.09 |
| Total | 7.49 | 8.07 | -0.58 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 1.71 | -1.71 |
| Private Land | 6.63 | 4. 42 | +2.21 |
| U.S. Bureau of Land Management | 0.84 | 1.94 | -1.10 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.02 | 0.02 | 0.00 |
| Total | 7.49 | 8.07 | -0.58 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 11 | 8 | +3 |
| Total | 11 | 8 | +3 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 5 | 7 | -2 |
| Additional USGS Streams | 3 | 6 | -3 |
| Total | 8 | 13 | -5 |

| Item | 2010 Proposed Route Segment (Miles of Land Crossed, except where noted) | MTV-20 (Miles of Land Crossed, except where noted) | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 6.35 | 7.00 | -0.65 |
| ≥ 5% and ≤ 15% | 1.10 | 1.02 | +0.08 |
| > 15% and ≤ 30% | 0.04 | 0.05 | -0.01 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 2 | 0 | +2 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 2 | 1 | +1 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Elg. (100%) | 1 Elg., 1 Pot. Elg., 1 Not Elg. (100%) | + 1 Pot. Elg., + 1 Not Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 1 | -1 |
| Sage-grouse Leks within 3 miles | 0 | 1 | -1 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 3 | 3 | 0 |
| Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 1 Wetland (PEM), 1 Noxious Weed (100%) | 0 (100%) | + 1 Wetland (PEM), +1 Noxious Weed |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $15,729,000 | $16,947,000 | -$1,218,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-21 Route Variation MTV-21 (North of Missouri River Variation)

MTV-21 (Figure I-2.4.2-16 and Table I-2.4.2-21) was a landowner's request to avoid crossing irrigation ditches. The variation at milepost 88.1 would be about 0.02 mile shorter than the 2010 proposed route segment it would replace on private land. Both routes would cross irrigated land, one minor road, three USGS streams, and the 2010 proposed route would cross 0.02 mile of developed land. No cultural resources or paleontological sites were identified during field surveys. For biological resources, desktop data indicated that there were one greater sage-grouse lek and three sharp-tailed grouse leks within 4 miles of both routes. Field surveys confirmed that there were no greater sage-grouse leks within 3 miles of either route. MDEQ has selected MTV-21 over the 2010 proposed route because it would avoid the irrigation ditches and has a greater potential for local acceptance.

### I-2.4.2-22 Route Variation MTV-22 (South of Missouri River Variation)

MTV-22 (Figure I-2.4.2-16 and Table I-2.4.2-22) was a MDEQ request to avoid crossing historical landslide areas and a landowner request to reach the top of the valley wall as quickly as possible while remaining as far from the Missouri River as possible. The river provides habitat for three species listed under the Endangered Species Act. The variation from milepost 89.9 to milepost 92.2 would be about 0.19 mile longer than the 2010 proposed route segment, which would include KEY-16 (see Section I-2.4.3.2.11). The variation would cross 0.37 mile more BLM land and 0.17 mile less Bureau of Reclamation land.

MTV-22 would be more than 100 feet from a water well. No cultural resources were identified during a Class III field survey. The variation could cross one additional significant paleontological site, but five fewer non-significant paleontological sites. It would not cross USGS streams, but would cross 0.11 mile less of forested/woodlands and 0.07 mile less of NLCD wetlands. Desktop data indicated that the variation would be closer to one greater sage-grouse lek, and field surveys confirmed that the variation would be located within 3 miles of one lek. Both routes would be within 4 miles of seven sharp-tailed grouse leks. No wetlands or noxious weed areas were identified during field surveys.

After consideration of MTV-22, the proposed 2010 route segment, and KEY-16, MDEQ has selected a combination of MTV-22 and the southern end of KEY-16 (see Section I-2.4.3.2.11). This will assist in minimizing the impacts from crossing a landslide area.

### I-2.4.2-23 Route Variation MTV-23 (Vandalia Canal Variation)

MTV-23 (Figure I-2.4.2-17 and Table I-2.4.2-23) was proposed by MDEQ to cross the Vandalia Canal at a preferred location. The variation from milepost 84.8 to milepost 86.0 would be the same length as the 2010 proposed route segment it would replace. Both routes would be on private land, cross 0.02 mile of developed land, and one minor road. The variation would cross 0.03 mile more hay land while the 2010 proposed route segment would cross 0.03 mile more range land and one additional USGS stream. MTV-23 was selected over the 2010 proposed route to minimize impacts from the canal crossing.

**TABLE I-2.4.2-21**
**Comparison of Montana Route Variation 21 (MTV-21) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-21 | Difference | Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-21 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.54 | 0.52 | +0.02 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.54 | 0.52 | +0.02 |
| Developed | 0.02 | 0.00 | +0.02 | ≥ 5% and ≤ 15% | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.02 | 0.00 | +0.02 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.02 | 0.02 | 0.00 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.51 | 0.49 | +0.02 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.01 | 0.01 | 0.00 | **Structures** | | | |
| Total | 0.54 | 0.52 | +0.02 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.54 | 0.52 | +0.02 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.54 | 0.52 | +0.02 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Biology (survey data)** | | | |
| Additional USGS Streams | 3 | 3 | 0 | Biological Resources (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Total | 3 | 3 | 0 | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $1,134,000 | $1,092,000 | +$42,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-22**
**Comparison of Montana Route Variation 22 (MTV-22) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted): 2010 Proposed Route Segment | MTV-22 | Difference | Item | Miles of Land Crossed (except where noted): 2010 Proposed Route Segment | MTV-22 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 2.36 | 2.55 | -0.19 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.25 | 0.15 | +0.10 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.92 | 0.95 | -0.03 |
| Forested/ Woodlands | 0.15 | 0.04 | +0.11 | > 15% and ≤ 30% | 0.99 | 1.22 | -0.23 |
| Wetlands | 0.24 | 0.17 | +0.07 | > 30% | 0.20 | 0.23 | -0.03 |
| Total | 0.39 | 0.21 | +0.18 | **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 2.24 | 2.44 | -0.20 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.12 | 0.11 | +0.01 | **Structures** | | | |
| Total | 2.36 | 2.55 | -0.19 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.00 | 0.00 | 0.00 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 1.00 | 1.37 | -0.37 | Paleo Findings (% Surveyed) | 1 Sig., 5 Not Sig. (100%) | 2 Sig. (100%) | -1 Sig., +5 Not Sig. |
| U.S. Bureau of Reclamation | 1.33 | 1.16 | +0.17 | | | | |
| ROW | 0.03 | 0.02 | +0.01 | **Grouse (desktop data)** | | | |
| Total | 2.36 | 2.55 | -0.19 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 3 | 3 | 0 | Sage-grouse Leks within 3 miles | 0 | 1 | -1 |
| Total | 3 | 3 | 0 | Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 2 | 3 | -1 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 4 | 6 | -2 |
| Intermittent Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 7 | 7 | 0 |
| Additional USGS Streams | 1 | 0 | +1 | **Biology (survey data)** | | | |
| Total | 1 | 0 | +1 | Biological Resources (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| | | | | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $4,956,000 | $5,355,000 | -$399,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-23**
**Comparison of Montana Route Variation 23 (MTV-23) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted): 2010 Proposed Route Segment | MTV-23 | Difference | Item | Miles of Land Crossed (except where noted): 2010 Proposed Route Segment | MTV-23 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.19 | 1.19 | 0.00 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.77 | 0.71 | +0.06 |
| Developed | 0.02 | 0.02 | 0.00 | ≥ 5% and ≤ 15% | 0.42 | 0.48 | -0.06 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.02 | 0.02 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.11 | 0.08 | +0.03 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.08 | 1.11 | -0.03 | **Structures** | | | |
| Total | 1.19 | 1.19 | 0.00 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class I)** | | | |
| Private Land | 1.19 | 1.19 | 0.00 | Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Cultural Resources in TRS | 11 | 11 | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.19 | 1.19 | 0.00 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 1 | 0 | +1 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 2 | 1 | +1 | Total Construction Cost | $2,499,000 | $2,499,000 | $0 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-24 Route Variation MTV-24 (Hay Creek Variation)

MTV-24 (Figure I-2.4.2-18 and Table I-2.4.2-24) was a landowner request to cross Hay Creek at a specific location and to avoid a water well near mileposts 162.2 and 162.9. Keystone had developed KEY-29 to avoid the water well, but the landowner reviewed KEY-29 and suggested developing MTV-24 instead to avoid the water well and cross Hay Creek at a specific location. The variation from milepost 161.5 to milepost 164.7 would be about 0.02 mile longer than the 2010 proposed route segment it would replace, which would be KEY-29.

MTV-24 would cross 0.01 mile less of developed land and one less minor road. A Class III cultural resources survey identified one eligible cultural resource for both the 2010 route and the variation; no paleontological sites were identified. The variation would cross 0.06 mile of forested/woodlands and five additional USGS streams. Biological surveys found one additional noxious weed area for MTV-24. Desktop data indicated that there was one sharp-tailed grouse lek within 3 miles of both routes.

Keystone has requested that MDEQ provide additional space beyond 500 feet at the Hay Creek crossing for construction. With this consideration, Keystone would replace the 2010 proposed route segment with MTV-24. MDEQ has agreed to this request and has selected MTV-24 in order to avoid the water well and will add a provision to allow additional work space beyond 500 feet at the Hay Creek crossing to help avoid disturbance to the stream.

### I-2.4.2-25 Route Variation MTV-25 (North of Yellowstone River Variation)

MTV-25 (Figure I-2.4.2-19 and Table I-2.4.2-25) was a landowner request to avoid an irrigated field. The variation from milepost 193.4 to milepost 194.9 would be about 0.04 mile longer than the 2010 proposed route segment it would replace on private land. It also would cross 0.02 mile more developed land and 0.48 mile less of irrigated land.

There would be three fewer structures within 500 feet of MTV-25. A Class III field survey found that both routes would cross one non-eligible cultural resource but no paleontological sites. MTV-25 would cross 0.04 mile of wetlands, which the proposed route segment would not cross. Field surveys also found that the variation would cross one additional noxious weed area.

Keystone determined that MTV-25 would be a reasonable variation to the 2010 proposed route. MDEQ has selected MTV-25 to avoid irrigated cropland and to address landowner concerns.

### I-2.4.2-26 Route Variation MTV-26 (South of Cabin Creek Variation)

MTV-26 (Figure I-2.4.2-20 and Table I-2.4.2-26) was a landowner requested variation to avoid corrals and a cut bank at a creek crossing. The variation would start on the KEY-35 (see Section I-2.4.3.2.23) realignment of the 2010 proposed route at milepost 214.4 and go to milepost 215.1. The variation would be about 0.09 mile longer than the 2010 proposed route segment it would replace and cross 0.28 mile more of BLM land.

Both routes would cross one minor road and two intermittent streams, but MTV-26 would cross within 100 feet of a water well. A Class III field survey did not find cultural resources or paleontological sites for either route. Field surveys found that the variation would cross one PEM wetland and one additional noxious weed area. Desktop data indicated that two greater sage-grouse leks were within 4 miles of both routes, and field surveys confirmed that these leks were within 3 miles of the routes.

Keystone determined that MTV-26 would be a reasonable variation to the proposed route. After consideration of MTV-26, the 2010 proposed route, and KEY-35 (see Section I-2.4.3.2.23), MDEQ has selected a combination of MTV-26 and KEY-35. MDEQ would widen the approved corridor 650 feet to the north of the selected route from the reference mileposts 214.8 to 215.5 to avoid a steep stream bank. MDEQ selected MTV-26 to avoid a water well and wooden corrals. The selected route consists of the widened portion of KEY-35 to the junction with MTV-26, then following MTV-26 to the far eastern end where it rejoins with the 2010 proposed route.

### I-2.4.2-27 Route Variation MTV-27 (Pennel Creek Variation)

MTV-27 (Figure I-2.4.2-21 and Table I-2.4.2-27) was a landowner request to move the 2010 proposed route away from their house, barns, water well, spreader dikes, and irrigated cropland. The variation would run from milepost 233.0 to milepost 236.3 and would be about 0.62 mile longer than the 2010 proposed route segment it would replace on private land. Keystone has also suggested a realignment of their 2009 proposed route in this area (Key-38) that generally straightens the original proposal.

MTV-27 would generally follow steeper terrain farther away from Pennel Creek and would not be within 500 feet of three structures. A Class III field survey found one non-eligible cultural resource on the variation, and no paleontological sites were found for either route. The variation would cross 0.16 mile more wetlands and one less intermittent stream. However, field surveys did not find any wetlands or noxious weed areas for either route. Desktop data indicated that there were six greater sage-grouse leks within 4 miles of each route and one sharp-tailed grouse lek within 2 miles of each route. Field surveys found that there were four greater sage-grouse leks within 3 miles of the route segment, but that the variation had five leks within 3 miles, including one additional greater sage-grouse lek located 2.8 miles southwest of the variation on moderate sloping terrain. This sloping terrain would potentially screen the sage grouse lek from one or both alternatives. Two of the leks identified for both routes would be 2.5 miles south of MTV-27.

Keystone opposes MTV-27 and states the MFSA findings required for certification under 75-20-301 MCA or the preferred location criteria of Circular MFSA-2 would not be satisfied. The variation would not improve minimizing impacts (Circular MFSA-2 75-20-301(1) (c) MCA) due to the one additional greater sage-grouse lek found closer to MTV-27. The variation would result in estimated additional costs of about $1,302,000, assuming an average cost per mile of $2.1 million. After consideration of the impacts associated with the 2010 proposed route and KEY-38, MDEQ has selected MTV-27 to avoid crossing flood-irrigated land and to address a landowner concern.

**TABLE I-2.4.2-24**
**Comparison of Montana Route Variation 24 (MTV-24) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) KEY-29 | MTV-24 | Difference | Item | Miles of Land Crossed (except where noted) KEY-29 | MTV-24 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 3.10 | 3.12 | -0.02 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.44 | 0.57 | -0.13 |
| Developed | 0.08 | 0.07 | +0.01 | ≥ 5% and ≤ 15% | 1.90 | 2.04 | -0.14 |
| Forested/ Woodlands | 0.00 | 0.06 | -0.06 | > 15% and ≤ 30% | 0.73 | 0.43 | +0.30 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.03 | 0.08 | -0.05 |
| Total | 0.08 | 0.13 | -0.05 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 2.98 | 2.38 | +0.60 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.12 | 0.74 | -0.62 | **Structures** | | | |
| Total | 3.10 | 3.12 | -0.02 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 3.10 | 3.12 | -0.02 | Cultural Findings (% Surveyed) | 1 Elg. (100%) | 1 Elg. (96%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (96%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 3.10 | 3.12 | -0.02 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 5 | 4 | +1 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 5 | 4 | +1 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Additional USGS Streams | 2 | 7 | -5 | Sharp-tailed Leks within 4 miles | 1 | 1 | 0 |
| Total | 3 | 8 | -5 | **Biology (survey data)** | | | |
| | | | | Biological Resources (% Surveyed) | 7 Noxious Weeds (100%) | 8 Noxious Weeds (100%) | -1 Noxious Weed |
| | | | | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $6,510,000 | $6,552,000 | -$42,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-25**
**Comparison of Montana Route Variation 25 (MTV-25) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted): 2010 Proposed Route Segment | Miles of Land Crossed (except where noted): MTV-25 | Difference |
|---|---|---|---|
| **Length** | 1.50 | 1.54 | -0.04 |
| **Land Cover** | | | |
| Developed | 0.02 | 0.04 | -0.02 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.04 | -0.04 |
| Total | 0.02 | 0.08 | -0.06 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.02 | 1.54 | -0.52 |
| Irrigated Land | 0.48 | 0.00 | +0.48 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 1.50 | 1.54 | -0.04 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 1.50 | 1.54 | -0.04 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 1.50 | 1.54 | -0.04 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 |
| Total | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 1 | 1 | 0 |
| Total | 2 | 2 | 0 |

| Item | Miles of Land Crossed (except where noted): 2010 Proposed Route Segment | Miles of Land Crossed (except where noted): MTV-25 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 1.19 | 0.67 | +0.52 |
| ≥ 5% and ≤ 15% | 0.26 | 0.86 | -0.60 |
| > 15% and ≤ 30% | 0.05 | 0.01 | +0.04 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 1 | 1 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 4 | 1 | +3 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Not Elg. (100%) | 1 Not Elg. (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 | 0 | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 1 Noxious Weed (100%) | 2 Noxious Weeds (100%) | - 1 Noxious Weed |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $3,150,000 | $3,234,000 | -$84,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-26**
**Comparison of Montana Route Variation 26 (MTV-26) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) KEY-35 | MTV-26 | Difference | Item | Miles of Land Crossed (except where noted) KEY-35 | MTV-26 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.74 | 0.83 | -0.09 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.23 | 0.36 | -0.13 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.51 | 0.47 | +0.04 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 1 | -1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.74 | 0.83 | -0.09 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.74 | 0.83 | -0.09 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.22 | 0.03 | +0.19 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 (100%) |
| U.S. Bureau of Land Management | 0.52 | 0.80 | -0.28 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 (100%) |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.74 | 0.83 | -0.09 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 1 | 1 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 1 | 1 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 2 | 2 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 2 | 2 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Intermittent Streams | 2 | 2 | 0 | **Biology (survey data)** | | | |
| Additional USGS Streams | 0 | 0 | 0 | | | | |
| Total | 2 | 2 | 0 | Biological Resources (% Surveyed) | 2 Noxious Weeds (100%) | 1 Wetland (PEM), 3 Noxious Weeds (100%) | -1 Wetland (PEM), -1 Noxious Weed |
| | | | | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $1,554,000 | $1,743,000 | -$189,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-27**
**Comparison of Montana Route Variation 27 (MTV-27) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-27 | Difference |
|---|---|---|---|
| **Length** | 3.34 | 3.96 | -0.62 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.08 | 0.24 | -0.16 |
| Total | 0.08 | 0.24 | -0.16 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.09 | 1.63 | -0.54 |
| Irrigated Land | 0.14 | 0.00 | +0.14 |
| Hay Land | 2.11 | 2.33 | -0.22 |
| Total | 3.34 | 3.96 | -0.62 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 3.34 | 3.96 | -0.62 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 3.34 | 3.96 | -0.62 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 4 | 4 | 0 |
| Total | 4 | 4 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 4 | 3 | +1 |
| Additional USGS Streams | 1 | 1 | 0 |
| Total | 5 | 4 | +1 |

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-27 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 2.05 | 1.65 | +0.40 |
| ≥ 5% and ≤ 15% | 1.28 | 2.23 | -0.95 |
| > 15% and ≤ 30% | 0.01 | 0.08 | -0.07 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 3 | 0 | +3 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 1 Not Elg. (100%) | -1 Not Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 (100%) |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 4 | 5 | -1 |
| Sage-grouse Leks within 4 miles | 6 | 6 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 4 miles | 1 | 1 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 0 (100%) | 0 (100%) | 0 (100%) |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $7,014,000 | $8,316,000 | -$1,302,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.2-28 Route Variation MTV-28 (Little Beaver Creek Variation)

MTV-28 (Figure I-2.4.2-22 and Table I-2.4.2-28) was proposed by MDEQ to relocate the Little Beaver Creek crossing to avoid a high vertical bank. Table I-2.4.2-28 shows no environmental differences between the variation and the 2010 proposed route segment. MDEQ has selected MTV-28 to avoid the high vertical bank.

### I-2.4.2-29 Route Variation MTV-29 (Cracker Box Creek Variation)

MTV-29 (Figure I-2.4.2-23 and Table I-2.4.2-29) was proposed by a landowner to avoid trees and windbreaks and a transmission tower at milepost 192. The variation would be about 0.11 mile longer than the 2010 proposed route segment from mileposts 190.4 to 192.2. Both routes would be on private land, would cross one minor road, 0.02 mile of developed land, and would be approximately 1.8 miles east of a sharp-tailed grouse lek. The variation would cross 0.24 mile more range land while the 2010 proposed route segment would cross 0.13 mile more hay land. MDEQ has selected MTV-29 to avoid crossing wind breaks, a location near a transmission line structure, and to address a landowner concern.

### I-2.4.2-30 Route Variation MTV-30 (Tributary to Frenchman Creek Variation)

MTV-30 (Figure I-2.4.2-24 and Table I-2.4.2-30) was proposed by MDEQ to avoid an unnamed intermittent tributary to Frenchman Creek and to utilize more public land. The variation would be about 0.14 mile shorter than the 2010 proposed route segment from about mileposts 19 to 22.5. The variation would cross 0.36 mile of BLM land while the 2010 proposed route segment would only cross private land. MTV-30 would avoid five minor roads but would be within 100 feet of a water well. The variation would not cross two intermittent streams and would cross two fewer USGS identified streams. Field surveys indicated that the variation would be about 0.3 mile (1.1 mile for the proposed route) east of one greater sage-grouse lek, which was not previously identified in the MFWP database or confirmed by field surveys within the past two years. Class III field surveys found that the 2010 proposed route segment APE would cross three additional potentially eligible cultural resources. Neither route would cross paleontological sites.

This variation was field reviewed by both MDEQ and Keystone in June of 2011. The variation APE would avoid crossing all but two potentially eligible cultural sites. The KEY-2 and KEY-3 realignments in this area would still cross through several cultural sites that would require testing to evaluate. MDEQ has selected MTV-30 to avoid crossing several streams and a greater number of cultural resources, and to utilize flatter terrain.

**TABLE I-2.4.2-28**
**Comparison of Montana Route Variation 28 (MTV-28) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2010 Proposed Route Segment | MTV-28 | Difference |
| **Length** | 0.17 | 0.17 | 0.00 |
| **Land Cover** | | | |
| Developed | 0.0 | 0.0 | 0.0 |
| Forested/ Woodlands | 0.0 | 0.0 | 0.0 |
| Wetlands | 0.0 | 0.0 | 0.0 |
| Total | 0.0 | 0.0 | 0.0 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 0.17 | 0.17 | 0.00 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 0.17 | 0.17 | 0.00 |
| **Land Ownership** | | | |
| State of Montana | 0.0 | 0.0 | 0.0 |
| Private Land | 0.17 | 0.17 | 0.00 |
| U.S. Bureau of Land Management | 0.0 | 0.0 | 0.0 |
| Local Government | 0.0 | 0.0 | 0.0 |
| ROW | 0.0 | 0.0 | 0.0 |
| Total | 0.17 | 0.17 | 0.00 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 0 | 0 | 0 |
| Total | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 0 | 0 | 0 |
| Total | 1 | 1 | 0 |

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2010 Proposed Route Segment | MTV-28 | Difference |
| **Slope** | | | |
| < 5% | 0.07 | 0.07 | 0.00 |
| ≥ 5% and ≤ 15% | 0.06 | 0.08 | -0.02 |
| > 15% and ≤ 30% | 0.04 | 0.02 | +0.02 |
| > 30% | 0.00 | 0.00 | 0.0 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class I)** | | | |
| Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| Cultural Resources in TRS | 1 | 1 | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $357,000 | $357,000 | $0 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-29**
**Comparison of Montana Route Variation 29 (MTV-29) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-29 | Difference | Item | Miles of Land Crossed (except where noted) 2010 Proposed Route Segment | MTV-29 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.85 | 1.96 | -0.11 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.59 | 1.58 | +0.01 |
| Developed | 0.02 | 0.02 | 0.00 | ≥ 5% and ≤ 15% | 0.26 | 0.38 | -0.12 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.02 | 0.02 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.18 | 0.42 | -0.24 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.67 | 1.54 | +0.13 | **Structures** | | | |
| Total | 1.85 | 1.96 | -0.11 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class I)** | | | |
| Private Land | 1.85 | 1.96 | -0.11 | Cultural Resources in 300-ft APE | 0 | 0 | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Cultural Resources in TRS | 3 | 3 | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.85 | 1.96 | -0.11 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 1 | 1 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 0 | 0 | 0 | Total Construction Cost | $3,885,000 | $4,116,000 | -$231,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.2-30**
**Comparison of Montana Route Variation 30 (MTV-30) with the Proposed Segment of the 2010 Route it Would Replace**

| Item | 2010 Proposed Route Segment (Miles of Land Crossed, except where noted) | MTV-30 | Difference |
|---|---|---|---|
| **Length** | 3.46 | 3.32 | +0.14 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 3.40 | 3.32 | +0.08 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.06 | 0.00 | +0.06 |
| Total | 3.46 | 3.32 | +0.14 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 3.46 | 2.96 | +0.50 |
| U.S. Bureau of Land Management | 0.00 | 0.36 | -0.36 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 3.46 | 3.32 | +0.14 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 5 | 0 | +5 |
| Total | 5 | 0 | +5 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 2 | 0 | +2 |
| Additional USGS Streams | 4 | 2 | +2 |
| Total | 6 | 2 | +4 |

| Item | 2010 Proposed Route Segment (Miles of Land Crossed, except where noted) | MTV-30 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 1.29 | 2.26 | -0.97 |
| ≥ 5% and ≤ 15% | 1.88 | 1.01 | +0.87 |
| > 15% and ≤ 30% | 0.25 | 0.05 | +0.20 |
| > 30% | 0.04 | 0.00 | +0.04 |
| **Water Wells within 100 ft** | 0 | 1 | -1 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 5 Pot. Elg. (100%) | 2 Pot. Elg. (100%) | +3 Pot. Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $7,266,000 | $6,972,000 | +$294,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.3 KEYSTONE REALIGNMENTS

This section describes the Keystone route changes proposed from February 15, 2009 to 2011 along the Steele City Segment in Montana. A total of 48 Keystone realignments were identified in Montana beginning at milepost 0 at the United States border and ending with a realignment crossing into South Dakota at milepost 282.6. Some realignments, specified under Section I-2.4.2, are also described for comparison as the whole or part of a 2010 proposed route segment or a Montana route variation. Keystone realignments would range in length from approximately 1,000 feet to 4 miles, and would diverge from the proposed Project route from about 40 feet to 3,350 feet.

MDEQ Circular MFSA-2, Section 2, item (13) (b) states, "(b) 'approved facility location' describes the precise location for a linear facility that is approved by the Department and accurately depicted to within 250 feet, unless otherwise specified by the Department, in the certificate on the map described in Section 3.3." For this reason, Keystone realignments described in this section have been separated into two categories, those that would diverge less than 250 feet from the 2009 proposed route and those that would diverge greater than 250 feet from the 2009 proposed route. Thus, of the total 48 Keystone realignments, 16 realignments were found to divert less than 250 feet from the 2009 proposed route and 32 realignments would divert more than 250 feet.

Keystone primarily proposed the 48 realignments to the 2009 proposed route to:

- Avoid existing facilities (e.g., compressor station, valve sites, etc.);
- Avoid cultural resources;
- Avoid steep or rough terrain to reduce disturbance or cost during construction;
- Avoid or realign a stream crossing location;
- Parallel an existing corridor; and
- Address landowner requests to avoid or move farther from a feature (e.g., residence, other types of structures, irrigation system, water well, stock pond, etc.) considered sensitive by the landowner.

#### I-2.4.3.1 Keystone Realignments Less than 250 Feet from the 2009 Proposed Project

Table I-2.4.3-1 provides an overview of the 16 Keystone suggested realignments that would divert less than 250 feet from the 2009 proposed Project route. Because these are minor realignments, a detailed analysis and comparison was not conducted and is not presented here. These realignments were not evaluated as part of MDEQ's preferred route but additional room would be granted (see Attachment 1, Environmental Specifications, Appendix E). However, two realignments less than 250 feet were combined with preferred route variations, including KEY-25 as part of MTV-5a (see Section I-2.4.2-5a) and KEY-34 as part of MTV-11 (see Section I-2.4.2-11).

**TABLE I-2.4.3-1**
**Keystone Realignments Less than 250 feet from the 2009 Proposed Route**

| Keystone Realignment (Figure) | Reason for Realignment |
|---|---|
| KEY-5 (Figure I-2.4.3-4) | To minimize construction impacts on cultural resource site features. |
| KEY-7 (Figure I-2.4.3-5) | To avoid construction on side hills. |
| KEY-9 (Figure I-2.4.3-5) | To avoid a cultural site. |

| TABLE I-2.4.3-1<br>Keystone Realignments Less than 250 feet from the 2009 Proposed Route | |
|---|---|
| **Keystone Realignment (Figure)** | **Reason for Realignment** |
| KEY-10 (Figure I-2.4.3-6) | To minimize construction impacts on cultural resource site features. |
| KEY-11 (Figure I-2.4.3-6) | BLM request to avoid a tributary to Buggy Creek near milepost 55. |
| KEY-18 (Figure I-2.4.3-10) | To avoid construction impacts on cultural resources. |
| KEY-19 (Figure I-2.4.3-10) | To move farther away from a cultural resource site. |
| KEY-20 (Figure I-2.4.3-10) | To avoid cultural site. |
| KEY-22 (Figure I-2.4.3-12) | To avoid steep butte near milepost 120.35. |
| KEY-23 (Figure I-2.4.3-12) | To avoid water wells/tanks. |
| KEY-25 (Figure I-2.4.3-12) | To avoid construction impacts on East Fork Prairie Creek. |
| KEY-34 (Figure I-2.4.3-17) | To avoid water wells and water tanks. |
| KEY-38 (Figure I-2.4.3-20) | To move farther away from water wells near mileposts 235.5 and 234.6. |
| KEY-42 (Figure I-2.4.3-22) | To avoid gas wells. |
| KEY-43 (Figure I-2.4.3-23) | To avoid water wells/tanks. |
| KEY-44 (Figure I-2.4.3-23) | To avoid gas wells. |

### I-2.4.3.2 Keystone Realignments Greater than 250 Feet from the 2009 Proposed Project

This section describes the characteristics of the Keystone proposed 32 realignments in Montana that would be greater than 250 feet from the 2009 proposed route, considered as part of MDEQ's preferred route.

#### I-2.4.3.2.1 Keystone Realignment KEY-1 (U.S. /Canada Border Realignment)

KEY-1 (see Figure I-2.4.3-2 and Table I-2.4.3-2) was proposed to move the United States border crossing approximately 595 feet to the west, to avoid paralleling the Foothills/Northern Border Pipeline through the existing compressor station and valve site. KEY-1 would begin at the start of the Steele City Segment and extend to milepost 0.15. Table I-2.4.3-2 presents a comparison of key environmental characteristics and other data associated with KEY-1 to those of the 2009 route segment. Both routes would be located on BLM land but the realignment would be 0.04 mile longer than the 2009 proposed route. Resource impacts would be essentially the same for the 2009 proposed route segment and KEY-1. MDEQ has selected KEY-1 to avoid going through the pump station of the Northern Border Pipeline.

#### I-2.4.3.2.2 Keystone Realignment KEY-2 (Cottonwood Creek Realignment)

KEY-2 (see Figure I-2.4.3-3 and Table I-2.4.3-3) was proposed to avoid construction impacts to cultural resources. The realignment would be located 1,500 feet east of the 2009 proposed route segment, from mileposts 16.5 to 19.9. The realignment would be 0.5 mile shorter in length than the 2009 proposed segment, avoid state land, and cross three fewer minor roads, but it also would be within 25 feet of one structure. A Class III field survey found that it would cross one additional potentially eligible cultural resource. The realignment also would cross three additional USGS streams and would be located on steeper terrain. MDEQ selected KEY-2, combined with MTV-30 (see Section I-2.4.2-30), to better address protection of cultural resources, to use more public land, to avoid more steep terrain, and to cross fewer streams.

**TABLE I-2.4.3-2**
**Comparison of Keystone Realignment 1 (KEY-1) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) | | | Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| | 2009 Proposed Route Segment | KEY-1 | Difference | | 2009 Proposed Route Segment | KEY-1 | Difference |
| **Length** | 0.15 | 0.19 | -0.04 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.15 | 0.19 | -0.04 |
| Developed | 0.015 | 0.012 | +0.03 | ≥ 5% and ≤ 15% | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.015 | 0.012 | +0.03 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.15 | 0.19 | -0.04 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.15 | 0.19 | -0.04 | Structures within 25 ft | 1 | 0 | +1 |
| **Land Ownership** | | | | Structures within 500 ft | 2 | 2 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.00 | 0.00 | 0.00 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.15 | 0.19 | -0.04 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.15 | 0.19 | -0.04 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 0 | 0 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 0 | 0 | 0 | Total Construction Cost | $315,000 | $399,000 | -$84,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences

**TABLE I-2.4.3-3**
**Comparison of Keystone Realignment 2 (KEY-2) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | 2009 Proposed Route Segment | KEY-2 | Difference |
|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | |
| **Length** | 3.43 | 3.38 | +0.05 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 3.43 | 3.38 | +0.05 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 3.43 | 3.38 | +0.05 |
| **Land Ownership** | | | |
| State of Montana | 0.40 | 0.00 | +0.40 |
| Private Land | 3.03 | 3.38 | -0.35 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 3.43 | 3.38 | +0.05 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 7 | 4 | +3 |
| Total | 7 | 4 | +3 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 4 | 7 | -3 |
| Total | 4 | 7 | -3 |

| Item | 2009 Proposed Route Segment | KEY-2 | Difference |
|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | |
| **Slope** | | | |
| < 5% | 2.06 | 1.31 | +0.75 |
| ≥ 5% and ≤ 15% | 1.36 | 1.73 | -0.37 |
| > 15% and ≤ 30% | 0.00 | 0.30 | -0.30 |
| > 30% | 0.01 | 0.04 | -0.03 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 1 | -1 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 2 Pot. Elg. (100%) | 3 Pot. Elg. (100%) | -1 Pot. Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $7,203,000 | $7,098,000 | +$105,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

#### I-2.4.3.2.3 Keystone Realignment KEY-3 (North of Frenchman Creek Realignment)

KEY-3 (see Figure I-2.4.3-3 and Table I-2.4.3-4) was proposed to avoid steep terrain near milepost 21.5 and cultural resources. A Class III field survey found that the proposed route would avoid six potentially eligible cultural resources found along the 2009 proposed segment. The realignment section from mileposts 21.1 to 21.7 was proposed to avoid construction across steep terrain.

KEY-3 would be about 0.1 mile shorter than the 2009 proposed segment, on private land, and cross four more minor roads and two additional USGS streams. Both routes would cross two intermittent streams. MDEQ selected KEY-3 to better address protection of cultural resources.

#### I-2.4.3.2.4 Keystone Realignment KEY-4 (Frenchman Creek Realignment)

KEY-4 (see Figure I-2.4.3-3 and Table I-2.4.3-5) was proposed to cross Frenchman Creek at a preferred crossing location and to avoid cultural resources. KEY-4 would parallel the Northern Border pipeline for approximately 7,000 feet. The realignment would be located 2,400 feet east of the 2009 proposed route segment from mileposts 24.8 to 27.0. Key-4 would be 0.4 mile shorter, cross two fewer minor roads, cross 0.16 mile less wetlands, and four additional USGS streams. A Class III field survey found that KEY-4 would also cross one additional potentially eligible cultural resource and one non-significant paleontological site. KEY-4 would also parallel an existing pipeline for about 1.4 miles across a relatively narrow portion of the Frenchman Creek Valley. MDEQ selected KEY-4 because it would parallel an existing pipeline and would provide a better crossing of Frenchman Creek than the 2009 proposed segment.

#### I-2.4.3.2.5 Keystone Realignment KEY-6 (Rock Creek Realignment)

KEY-6 (see Figure I-2.4.3-4 and Table I-2.4.3-6) was proposed to cross terrain features near Rock Creek at a preferred location suitable for construction. The realignment would be from mileposts 38.4 to 40 and about 0.18 mile longer than the 2009 proposed route segment. KEY-6 would cross 0.15 mile more state land and 0.03 mile more BLM land than the 2009 proposed route segment it would replace.

Both routes would cross range land, two minor roads, and one perennial stream, Rock Creek. The realignment would cross 0.06 mile of wetlands and one fewer USGS stream. The KEY-6 alignment would avoid a deep pool in Rock Creek by crossing the creek in a shallower area. A Class III field survey found that KEY-6 would also cross one additional potentially eligible cultural resource, but avoid one non-eligible cultural resource. Field surveys also found that the 2009 proposed route would cross one significant and one non-significant paleontological site, whereas KEY-6 would avoid them. MDEQ selected KEY-6 because it would cross less steep terrain and use more public land than the 2009 proposed route segment.

**TABLE I-2.4.3-4**
**Comparison of Keystone Realignment 3 (KEY-3) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted): 2009 Proposed Route Segment | KEY-3 | Difference | Item | Miles of Land Crossed (except where noted): 2009 Proposed Route Segment | KEY-3 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 2.90 | 2.89 | +0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.19 | 1.66 | -0.47 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 1.61 | 1.10 | +0.51 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.10 | 0.13 | -0.03 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 2.90 | 2.89 | +0.01 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 2.90 | 2.89 | +0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 2.90 | 2.89 | +0.01 | Cultural Findings (% Surveyed) | 13 Pot. Elg. (100%) | 7 Pot. Elg. (100%) | +6 Pot. Elg. |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 2.90 | 2.89 | +0.01 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 2 | 6 | -4 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 2 | 6 | -4 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Intermittent Streams | 2 | 2 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Additional USGS Streams | 4 | 6 | -2 | **Construction Costs** | | | |
| Total | 6 | 8 | -2 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $6,090,000 | $6,069,000 | +$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-5**

**Comparison of Keystone Realignment 4 (KEY-4) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-4 | Difference |
|---|---|---|---|
| **Length** | 2.16 | 2.12 | +0.04 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.50 | 0.34 | +0.16 |
| Total | 0.50 | 0.34 | +0.16 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.32 | 1.34 | -0.02 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.84 | 0.78 | +0.06 |
| Total | 2.16 | 2.12 | +0.04 |
| **Land Ownership** | | | |
| State of Montana | 0.56 | 0.25 | +0.31 |
| Private Land | 1.55 | 1.48 | +0.07 |
| U.S. Bureau of Land Management | 0.05 | 0.14 | -0.09 |
| Local Government | 0.00 | 0.25 | -0.25 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 2.16 | 2.12 | +0.04 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 6 | 4 | +2 |
| Total | 6 | 4 | +2 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 0 | 4 | -4 |
| Total | 1 | 5 | -4 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-4 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 1.60 | 1.48 | +0.12 |
| ≥ 5% and ≤ 15% | 0.25 | 0.32 | -0.07 |
| > 15% and ≤ 30% | 0.17 | 0.22 | -0.05 |
| > 30% | 0.14 | 0.10 | +0.04 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Pot. Elg. (100%) | 2 Pot. Elg. (100%) | -1 Pot. Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 1 Not Sig. (100%) | -1 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $4,536,000 | $4,452,000 | +$84,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-6**
**Comparison of Keystone Realignment 6 (KEY-6) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2009 Proposed Route Segment | KEY-6 | Difference |
| **Length** | 1.60 | 1.78 | -0.18 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.06 | -0.06 |
| Total | 0.00 | 0.06 | -0.06 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.60 | 1.78 | -0.18 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 1.60 | 1.78 | -0.18 |
| **Land Ownership** | | | |
| State of Montana | 0.93 | 1.08 | -0.15 |
| Private Land | 0.14 | 0.14 | 0.00 |
| U.S. Bureau of Land Management | 0.53 | 0.56 | -0.03 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 1.60 | 1.78 | -0.18 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 2 | 1 | +1 |
| Total | 3 | 2 | +1 |

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2009 Proposed Route Segment | KEY-6 | Difference |
| **Slope** | | | |
| < 5% | 0.58 | 0.76 | -0.18 |
| ≥ 5% and ≤ 15% | 0.64 | 0.54 | +0.10 |
| > 15% and ≤ 30% | 0.20 | 0.38 | -0.18 |
| > 30% | 0.18 | 0.10 | +0.08 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Pot. Elg., 1 Not Elg. (100%) | 2 Pot. Elg. (100%) | -1 Pot. Elg., +1 Not Elg. |
| Paleo Findings (% Surveyed) | 1 Sig., 1 Not Sig. (100%) | 0 (100%) | +1 Sig., +1 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $3,360,000 | $3,738,000 | -$378,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of difference.

#### I-2.4.3.2.6 Keystone Realignment KEY-8 (Lime Creek Realignment)

KEY-8 (see Figure I-2.4.3-5 and Table I-2.4.3-7) was proposed to cross Lime Creek at a preferred crossing location and minimize construction impacts to cultural resources. The realignment would be located 840 feet east of the 2009 proposed route segment and would be 0.02 mile longer in length. KEY-8 would cross more local government land than the 2009 proposed route and the same amount of state land.

Field surveys found that the realignment would avoid one potentially eligible and one non-eligible cultural resources, and also would cross a non-significant paleontological site. The 2009 proposed route segment would cross a wetland at approximately milepost 45, which would be avoided by the realignment. Both routes would cross four USGS streams. Desktop data indicated that the realignment would cross 0.13 mile more of core greater sage-grouse area, and that both routes would be within 3 miles of one greater sage-grouse lek. Field surveys verified that greater sage-grouse lek, which would be located more than 2 miles from both routes, much of which would not be visible due to topography. Three sharp-tailed grouse leks would be within 4 miles of both alignments, the closest being about 0.75 mile away. MDEQ selected KEY-8 because it would avoid cultural resource sites and minimize impacts to Lime Creek.

#### I-2.4.3.2.7 Keystone Realignment KEY-12 (North of Cherry Creek Realignment)

KEY-12 (see Figure I-2.4.3-6 and Table I-2.4.3-8) was proposed to minimize impacts to cultural resources. The realignment would be the same length as the 2009 proposed route segment it would replace but would divert west for 300 feet, from milepost 62.8 to milepost 64.2. Both routes would cross 0.74 mile of BLM land, one minor road, and one USGS stream. A Class III field survey found that the realignment would avoid one additional potentially eligible cultural resource. Desktop data indicated that the realignment would cross 0.02 mile more core greater sage-grouse area, and that both routes would be within 4 miles of six sharp-tailed grouse leks, but KEY-12 would move the centerline about 20 yards away from the closest of these (less than 0.1 mile away from both alignments). MDEQ selected KEY-12 because it would avoid cultural resource sites.

#### I-2.4.3.2.8 Keystone Realignment KEY-13 (Cherry Creek Realignment)

KEY-13 (see Figure I-2.4.3-7 and Table I-2.4.3-9) was proposed to accommodate a landowner’s request to avoid wetlands, a natural spring, and highly alkali soils that have a poor soil structure and low infiltration capacity. The realignment from mileposts 64.9 to 68.2 would be 0.02 mile shorter than the 2009 proposed route segment it would replace and would cross 0.17 mile fewer of BLM land. The realignment would cross one more minor road and have three fewer structures within 500 feet. Field surveys found one potentially eligible cultural resource but no paleontological sites along the realignment. KEY-13 would cross 0.02 mile more wetlands, one more intermittent stream, and two fewer USGS streams. The proposed route and the realignment would be within 4 miles of one greater sage-grouse lek, but not visible from the lek, and within 2 miles of three sharp-tailed grouse leks. MDEQ did not select KEY-13 (see MTV-20 in Section I-2.4.2-20).

**TABLE I-2.4.3-7**
**Comparison of Keystone Realignment 8 (KEY-8) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-8 | Difference |
|---|---|---|---|
| **Length** | 2.89 | 2.91 | -0.02 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.03 | 0.00 | +0.03 |
| Total | 0.03 | 0.00 | +0.03 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 2.56 | 2.61 | -0.05 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.33 | 0.30 | +0.03 |
| Total | 2.89 | 2.91 | -0.02 |
| **Land Ownership** | | | |
| State of Montana | 1.34 | 1.34 | 0.00 |
| Private Land | 1.30 | 1.29 | +0.01 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.25 | 0.28 | -0.03 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 2.89 | 2.91 | -0.02 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |
| **Number of Railroad Crossing** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 2 | 2 | 0 |
| Additional USGS Streams | 4 | 4 | 0 |
| Total | 6 | 6 | 0 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-8 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 1.78 | 1.50 | +0.28 |
| ≥ 5% and ≤ 15% | 1.02 | 1.33 | -0.31 |
| > 15% and ≤ 30% | 0.09 | 0.08 | +0.01 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Pot. Elg., 1 Not Elg. (100%) | 0 (100%) | +1 Pot. Elg., +1 Not Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 1 Not Sig. (100%) | -1 Not Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 2.34 | 2.47 | -0.13 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 1 | 1 | 0 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 3 miles | 2 | 2 | 0 |
| Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $6,069,000 | $6,111,000 | -$42,000 |
| Environmental Mitigation Cost | $18,720 | $19,760 | -$1,040 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-8**
**Comparison of Keystone Realignment 12 (KEY-12) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-12 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-12 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.45 | 1.45 | 0.00 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.26 | 1.15 | +0.11 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.19 | 0.30 | -0.11 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.45 | 1.45 | 0.00 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.00 | 0.00 | 0.00 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.70 | 0.70 | 0.00 | Cultural Findings (% Surveyed) | 1 Elg., 2 Pot. Elg. (100%) | 1 Elg., 1 Pot. Elg. (100%) | +1 Pot. Elg. |
| U.S. Bureau of Land Management | 0.74 | 0.74 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 1.45 | 1.45 | 0.00 | Sage-grouse Core Area crossed | 1.07 | 1.09 | -0.02 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Intermittent Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 6 | 6 | 0 |
| Additional USGS Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Total | 1 | 1 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $3,045,000 | $3,045,000 | $0 |
| | | | | Environmental Mitigation Cost | $8,560 | $8,720 | -$160 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-9**
**Comparison of Keystone Realignment 13 (KEY-13) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-13 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-13 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 3.30 | 3.28 | +0.02 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 2.63 | 2.87 | -0.24 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.61 | 0.38 | +0.23 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.06 | 0.03 | +0.03 |
| Wetlands | 0.04 | 0.06 | -0.02 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.04 | 0.06 | -0.02 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.84 | 1.69 | +0.15 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.46 | 1.59 | -0.13 | **Structures** | | | |
| Total | 3.30 | 3.28 | +0.02 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 4 | 1 | +3 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 2.29 | 2.44 | -0.15 | Cultural Findings (% Surveyed) | 0 (100%) | 1 Pot. Elg. (100%) | -1 Pot. Elg. |
| U.S. Bureau of Land Management | 1.01 | 0.84 | +0.17 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 3.30 | 3.28 | +0.02 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 4 | 5 | -1 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 4 | 5 | -1 | Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Intermittent Streams | 1 | 2 | -1 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Additional USGS Streams | 2 | 0 | +2 | **Construction Costs** | | | |
| Total | 3 | 2 | +1 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $6,930,000 | $6,888,000 | +$42,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

#### I-2.4.3.2.9 Keystone Realignment KEY-14 (East Cherry Creek Realignment)

KEY-14 (see Figure I-2.4.3-7 and Table I-2.4.3-10) was a landowner's request to avoid springs and wetlands. The realignment from mileposts 69.1 to 70.8 would be 0.01 mile longer than the 2009 proposed route segment it would replace on private land. Both KEY-14 and the 2009 proposed route segment would cross 0.04 mile of developed land, two minor roads, and be within 500 feet of one residence. The realignment would avoid being within 500 of two structures but would be within 100 feet one water well. Field surveys found one eligible cultural resource along both routes but no paleontological sites. Also, both routes would cross 0.18 mile of wetlands, two intermittent streams and one USGS stream, and desktop data indicated that they would be within 3 miles of one unconfirmed greater sage-grouse lek. MDEQ did not select KEY-14 (see MTV-20 in Section I-2.4.2-20).

#### I-2.4.3.2.10 Keystone Realignment KEY-15 (North of Missouri River Realignment)

KEY-15 (see Figure I-2.4.3-8 and Table I-2.4.3-11) was proposed to avoid two additional potentially eligible cultural resources. The realignment from mileposts 77.0 to 78.9 would be 0.03 mile longer than the 2009 proposed route segment it would replace. The realignment would cross 0.18 mile more state land and 0.15 mile less private land. KEY-15 would cross 0.02 mile less developed land and would be within 500 feet of four additional structures. Both routes would cross two minor roads, one intermittent stream, and one USGS stream. MDEQ selected KEY-15 because it would avoid crossing two potentially eligible cultural resources and would cross more public land.

#### I-2.4.3.2.11 Keystone Realignment KEY-16 (South of Missouri River Realignment)

KEY-16 (see Figure I-2.4.3-9 and Table I-2.4.3-12) would avoid construction along a steep side hill near milepost 91.6. The realignment from mileposts 90.8 to 93.0 would be about 0.05 mile longer than the 2009 proposed route segment it would replace. The realignment would cross 0.07 mile more BLM land, 0.02 mile less private land, and one fewer USGS stream. KEY-16 and the 2009 proposed route segment would cross range land and two minor roads. Field surveys did not find any cultural resources for either route but did find one non-significant paleontological site. Both routes also would cross 0.02 mile of forested/woodlands. Desktop data indicated that both routes would be within 4 miles of one greater sage-grouse lek, which would be out of view from the pipeline, and eight sharp-tailed grouse leks. All the sharp-tailed grouse leks would be more than a mile from the pipeline, and most would be screened from view of the pipeline by topography. MDEQ selected the southern 1.1 miles of KEY-16, together with MTV-22. While KEY-16 along its entire length would cross more of a landslide area south of the Missouri River, the selected portion of KEY-16 together with MTV-22 would cross the landslide area more directly (see Section I-2.4.2-22).

#### I-2.4.3.2.12 Keystone Realignment KEY-17 (West Fork Lost Creek Realignment)

KEY-17 (see Figure I-2.4.3-9 and Table I-2.4.3-13) was proposed to avoid a cultural resource. The realignment would be located 300 feet east of the 2009 proposed route segment. The 2009 proposed route segment would be within 100 feet of one water well. Both routes would be the same length on BLM land and cross one minor road, one intermittent stream, and one USGS stream. Desktop data indicated that both routes would be within 4 miles of two unconfirmed greater sage-grouse leks, which would be obscured by topography, and eight sharp-tailed grouse leks. Field surveys found one unevaluated cultural resource on both routes but no paleontological sites. MDEQ selected KEY-17 because it farther avoids the unevaluated cultural site.

## TABLE I-2.4.3-10
## Comparison of Keystone Realignment 14 (KEY-14) with the Proposed Segment of the 2009 Route it Would Replace

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-14 | Difference |
|---|---|---|---|
| **Length** | 1.72 | 1.73 | -0.01 |
| **Land Cover** | | | |
| Developed | 0.04 | 0.04 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.18 | 0.18 | 0.00 |
| Total | 0.22 | 0.22 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 1.42 | 1.46 | -0.04 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.30 | 0.27 | +0.03 |
| Total | 1.72 | 1.73 | -0.01 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 1.70 | 1.71 | -0.01 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.02 | 0.02 | 0.00 |
| Total | 1.72 | 1.73 | -0.01 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |
| **Number of Railroad Crossings** | 1 | 1 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 2 | 2 | 0 |
| Additional USGS Streams | 1 | 1 | 0 |
| Total | 3 | 3 | 0 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-14 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 1.29 | 1.34 | -0.05 |
| ≥ 5% and ≤ 15% | 0.42 | 0.38 | +0.04 |
| > 15% and ≤ 30% | 0.01 | 0.01 | 0.00 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 1 | -1 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 1 | 1 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 2 | 0 | +2 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Elg. (100%) | 1 Elg. (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 1 | 1 | 0 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $3,612,000 | $3,633,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-11**
**Comparison of Keystone Realignment 15 (KEY-15) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted): 2009 Proposed Route Segment | KEY-15 | Difference | Item | Miles of Land Crossed (except where noted): 2009 Proposed Route Segment | KEY-15 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.93 | 1.96 | -0.03 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.48 | 1.36 | +0.12 |
| Developed | 0.06 | 0.04 | +0.02 | ≥ 5% and ≤ 15% | 0.31 | 0.36 | -0.05 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.13 | 0.18 | -0.05 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.01 | 0.06 | -0.05 |
| Total | 0.06 | 0.04 | +0.02 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.42 | 1.46 | -0.04 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.30 | 0.27 | +0.03 | **Structures** | | | |
| Total | 1.93 | 1.96 | -0.03 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 1 | 5 | -4 |
| State of Montana | 0.78 | 0.96 | -0.18 | **Cultural Resources (Class III)** | | | |
| Private Land | 1.15 | 1.00 | +0.15 | Cultural Findings (% Surveyed) | 3 Pot. Elg. (100%) | 1 Pot. Elg. (100%) | +2 Pot. Elg. |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 1.93 | 1.96 | -0.03 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 2 | 2 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Additional USGS Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Total | 2 | 2 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $4,053,000 | $4,116,000 | -$63,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4-3.12**
**Comparison of Keystone Realignment 16 (KEY-16) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-16 | Difference |
|---|---|---|---|
| **Length** | 2.24 | 2.29 | -0.05 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.02 | 0.02 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.02 | 0.02 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 2.24 | 2.29 | -0.05 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 2.24 | 2.29 | -0.05 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 0.77 | 0.75 | +0.02 |
| U.S. Bureau of Land Management | 1.47 | 1.54 | -0.07 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 2.24 | 2.29 | -0.05 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 2 | 1 | +1 |
| Total | 2 | 1 | +1 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-16 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 0.18 | 0.18 | 0.00 |
| ≥ 5% and ≤ 15% | 1.14 | 1.25 | -0.11 |
| > 15% and ≤ 30% | 0.69 | 0.71 | -0.02 |
| > 30% | 0.23 | 0.15 | +0.08 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Paleo Findings (% Surveyed) | 1 Not Sig. (100%) | 1 Not Sig. (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 3 | 3 | 0 |
| Sharp-tailed Leks within 3 miles | 5 | 5 | 0 |
| Sharp-tailed Leks within 4 miles | 8 | 8 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $4,704,000 | $4,809,000 | -$105,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-13**
**Comparison of Keystone Realignment 17 (KEY-17) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-17 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-17 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.81 | 0.81 | 0.00 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.02 | 0.00 | +0.02 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.34 | 0.38 | -0.04 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.40 | 0.42 | -0.02 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.05 | 0.01 | +0.04 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.81 | 0.81 | 0.00 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.81 | 0.81 | 0.00 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.00 | 0.00 | 0.00 | Cultural Findings (% Surveyed) | 1 Pot. Elg. (100%) | 1 Pot. Elg. (100%) | 0 |
| U.S. Bureau of Land Management | 0.81 | 0.81 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 0.81 | 0.81 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 2 | 2 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 6 | 6 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 8 | 8 | 0 |
| Additional USGS Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Total | 2 | 2 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $1,701,000 | $1,701,000 | $0 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

#### I-2.4.3.2.13 Keystone Realignment KEY-21 (South Fork Shade Creek Realignment)

KEY-21 (see Figure I-2.4.3-11 and Table I-2.4.3-14) was proposed to avoid rough terrain near mileposts 112.3, 112.8, and 115. The realignment was shortened from mileposts 111.7 to 114.3, with the remaining section at milepost 115 being dropped with the consideration of KEY-48. The realignment would locate the pipeline on more vegetated slopes rather than unvegetated clayey badland soils. It would also extend the proximity to two small reservoirs by roughly 150 to 200 feet. The realignment would be 0.01 mile longer than the 2009 proposed route segment it would replace and would cross 0.01 mile less BLM land and 0.01 mile more state land.

KEY-21 would cross two more minor roads. A Class III field survey found one more potentially eligible cultural resource on the realignment. KEY-21 would cross two fewer intermittent streams. Desktop data indicated that both routes would be located within 4 miles of six greater sage-grouse leks, but some of those leks would be partially screened from views of the pipeline by topography. MDEQ selected the portion of KEY-21 north of KEY-48 to better avoid steep terrain.

#### I-2.4.3.2.14 Keystone Realignment KEY-24 (Middle Fork Prairie Elk Creek Realignment)

KEY-24 (see Figure I-2.4.3-12 and Table I-2.4.3-15) was proposed by a landowner to avoid one water well near milepost 124.6 and construction through a pond. The realignment would be located 1,100 feet west of the 2009 proposed route segment, from mileposts 123.1 to 125.3. KEY-24 would be 0.04 mile longer on private land, and cross 0.14 mile more developed land, two more minor roads, and would not be within 100 feet of a water well. Field surveys did not find any cultural resource or paleontological sites along either route. The realignment would not cross forested/woodlands, but it would cross a wetland and two additional USGS streams. MDEQ selected KEY-24 to address landowner objectives, and to avoid a water well and construction through a pond.

#### I-2.4.3.2.15 Keystone Realignment KEY-26 (Lone Tree Creek Realignment)

KEY-26 (see Figure I-2.4.3-13 and Table I-2.4.3-16) was proposed to accommodate a landowner’s request to move the proposed route farther away from a residence and corrals. The realignment would be from mileposts 143.0 to 144.5 and would be about 0.01 mile longer than the 2009 proposed route segment on private land. KEY-26 and the 2009 proposed route segment would cross 0.02 mile of developed land and one minor road. Field surveys did not find any cultural resources or paleontological sites along either route. The realignment would cross five additional USGS streams. MDEQ selected MTV-6, MTV-6a, MTV-6b, and MTV-6c over the 2009 proposed route segment (see Section I-2.4.2-6); therefore, KEY-26 was not selected.

#### I-2.4.3.2.16 Keystone Realignment KEY-27 (Buffalo Springs Creek Realignment)

KEY-27 (see Figure I-2.4.3-13 and Table I-2.4.3-17) was proposed to accommodate a landowner’s request to move the pipeline farther away from a residence and avoid wetlands and streams near milepost 147.6. The realignment would be from mileposts 146.5 to 148.5 and would be about 0.01 mile shorter than the 2009 proposed route segment, but would cross 0.10 mile more private land. KEY-27 would cross 0.01 mile more of developed land, one less minor road, and be within 25 feet and 500 feet of two fewer structures. Field surveys found that the realignment would cross one less non-eligible cultural resource, and neither route would cross a paleontological site. Both routes would cross two major roads and one intermittent stream. KEY-27 would cross 0.09 mile less wetlands and two fewer USGS streams. MDEQ selected MTV-6, MTV-6a, MTV-6b, and MTV-6c over the 2009 proposed route segment (see Section I-2.4.2-6); therefore, KEY-27 was not selected.

**TABLE I-2.4.3-14**
**Comparison of Keystone Realignment 21 (KEY-21) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-21 | Difference |
|---|---|---|---|
| **Length** | 2.15 | 2.16 | -0.01 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 2.15 | 2.16 | -0.01 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.00 | 0.00 | 0.00 |
| Total | 2.15 | 2.16 | -0.01 |
| **Land Ownership** | | | |
| State of Montana | 1.18 | 1.19 | -0.01 |
| Private Land | 0.81 | 0.82 | -0.01 |
| U.S. Bureau of Land Management | 0.16 | 0.15 | +0.01 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 2.15 | 2.16 | -0.01 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 3 | 5 | -2 |
| Total | 3 | 5 | -2 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 2 | 0 | +2 |
| Additional USGS Streams | 1 | 1 | 0 |
| Total | 3 | 1 | +2 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-21 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 0.38 | 0.43 | -0.05 |
| ≥ 5% and ≤ 15% | 1.40 | 1.44 | -0.04 |
| > 15% and ≤ 30% | 0.33 | 0.25 | +0.08 |
| > 30% | 0.04 | 0.04 | 0 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Pot. Elg. (100%) | 2 Pot. Elg. (100%) | -1 Pot. Elg. |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 2 | 2 | 0 |
| Sage-grouse Leks within 4 miles | 6 | 6 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $4,515,000 | $4,536,000 | -$21,000 |
| Environmental Mitigation Cost | $17,200 | $17,280 | -$80 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-15**
**Comparison of Keystone Realignment 24 (KEY-24) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2009 Proposed Route Segment | KEY-24 | Difference |
| **Length** | 2.15 | 2.19 | -0.04 |
| **Land Cover** | | | |
| Developed | 0.04 | 0.18 | -0.14 |
| Forested/ Woodlands | 0.01 | 0.00 | +0.01 |
| Wetlands | 0.00 | 0.03 | -0.03 |
| Total | 0.05 | 0.21 | -0.16 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 0.87 | 0.68 | +0.19 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 1.28 | 1.51 | -0.23 |
| Total | 2.15 | 2.19 | -0.04 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 2.15 | 2.19 | -0.04 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 2.15 | 2.19 | -0.04 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 4 | -2 |
| Total | 2 | 4 | -2 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 |
| Additional USGS Streams | 3 | 5 | -2 |
| Total | 3 | 5 | -2 |

| Item | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|
| | 2009 Proposed Route Segment | KEY-24 | Difference |
| **Slope** | | | |
| < 5% | 0.28 | 0.26 | +0.02 |
| ≥ 5% and ≤ 15% | 1.57 | 1.58 | -0.01 |
| > 15% and ≤ 30% | 0.30 | 0.35 | -0.05 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $4,515,000 | $4,599,000 | -$84,000 |
| Environmental Mitigation Cost | $6,720 | $4,880 | +$1,840 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-16**
**Comparison of Keystone Realignment 26 (KEY-26) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-26 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-26 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.48 | 1.49 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.18 | 0.35 | -0.17 |
| Developed | 0.02 | 0.02 | 0.00 | ≥ 5% and ≤ 15% | 1.30 | 1.14 | +0.16 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.02 | 0.02 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.06 | 0.02 | +0.04 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.42 | 1.47 | -0.05 | **Structures** | | | |
| Total | 1.48 | 1.49 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 1.48 | 1.49 | -0.01 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.48 | 1.49 | -0.01 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 5 | -5 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 0 | 5 | -5 | Total Construction Cost | $3,108,000 | $3,129,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-17**
**Comparison of Keystone Realignment 27 (KEY-27) with the Proposed Segment of the 2009 Route it Would Replace**

| | Miles of Land Crossed (except where noted) | | | | Miles of Land Crossed (except where noted) | | |
|---|---|---|---|---|---|---|---|
| **Item** | **2009 Proposed Route Segment** | **KEY-27** | **Difference** | **Item** | **2009 Proposed Route Segment** | **KEY-27** | **Difference** |
| **Length** | 2.01 | 2.00 | +0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.74 | 0.50 | +0.24 |
| Developed | 0.16 | 0.17 | -0.01 | ≥ 5% and ≤ 15% | 1.18 | 1.35 | -0.17 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.09 | 0.15 | -0.06 |
| Wetlands | 0.11 | 0.02 | +0.09 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.27 | 0.19 | -0.08 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.31 | 1.31 | 0.00 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.70 | 0.69 | +0.01 | **Structures** | | | |
| Total | 2.01 | 2.00 | +0.01 | Structures within 25 ft | 1 | 0 | +1 |
| **Land Ownership** | | | | Structures within 500 ft | 2 | 1 | +1 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 1.90 | 2.00 | -0.10 | | | | |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Cultural Findings (% Surveyed) | 1 Elg. (100%) | 1 Elg., 1 Not Elg. (100%) | -1 Not Elg. |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.11 | 0.00 | +0.11 | **Grouse (desktop data)** | | | |
| Total | 2.01 | 2.00 | +0.01 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 2 | 2 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 0 | +1 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 3 | 2 | +1 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Additional USGS Streams | 2 | 0 | +2 | **Construction Costs** | | | |
| Total | 3 | 1 | +2 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $4,221,000 | $4,200,000 | +$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.3.2.17 Keystone Realignment KEY-28 (South of Buffalo Springs Creek Realignment)

KEY-28 (see Figure I-2.4.3-14 and Table I-2.4.3-18) was proposed to avoid a rough drainage wash area near milepost 153.7. The realignment would be from mileposts 153.2 to 154.1 and would be about 0.01 mile longer than the 2009 proposed route segment on private land. KEY-28 would cross 0.01 mile less of developed land and would be within 100 feet of one water well. Field surveys found that both routes would cross one eligible cultural resource but no paleontological sites. MDEQ selected MTV-6, MTV-6a, MTV-6b, and MTV-6c over the 2009 proposed route segment (see Section I-2.4.2-6); therefore, KEY-28 was not selected.

### I-2.4.3.2.18 Keystone Realignment KEY-29 (Hay Creek Realignment)

KEY-29 (see Figure I-2.4.3-14 and Table I-2.4.3-19) was proposed to accommodate a landowner's request to avoid water wells near milepost 162.2 and milepost 162.9, and a tree line near milepost 163.2. After further discussions with the landowner, MDEQ developed MTV-24 which better avoided the water well and was more preferable to the landowner (see Section I-2.4.2-24). The realignment would be from mileposts 161.2 to 164.2 and would be about 0.01 mile longer than the 2009 proposed route segment on private land. The realignment would cross 0.01 mile more developed land, no forested/woodlands, and one more minor road. Field surveys found that both routes would cross one eligible and one non-eligible cultural resource, but no paleontological sites. Both routes would cross one intermittent stream, but the realignment would cross three fewer USGS streams. Desktop data indicated that two sharp-tailed grouse leks would be located within 3 miles of both routes. MDEQ did not select KEY-29 (see MTV-24 in Section I-2.4.3.2.17).

### I-2.4.3.2.19 Keystone Realignment KEY-30 (Cracker Box Creek Realignment)

KEY-30 (see Figure I-2.4.3-15 and Table I-2.4.3-20) was proposed to address a landowner's request to avoid grain bins near milepost 183.1. The realignment would be from mileposts 182.0 to 184.4 and would be about 0.02 mile shorter than the 2009 proposed route segment on private land. The realignment would cross 0.02 mile more developed land, one fewer USGS stream, and no water wells would be within 100 feet. Both routes would cross four minor roads. The realignment would be within 500 feet of four structures whereas the 2009 proposed route would be within 25 feet of four structures. Field surveys did not find any cultural resources or paleontological sites along either route. Desktop data indicated that there were three sharp-tailed grouse leks located within 3 miles of the proposed route and KEY-30; the closest would be more than 2 miles away. MDEQ selected KEY-30 to address a landowner objective to avoid grain bins.

### I-2.4.3.2.20 Keystone Realignment KEY-31 (Yellowstone River Realignment)

KEY-31 (see Figure I-2.4.3-16 and Table I-2.4.3-21) was proposed to avoid construction through rough drainage and terrain features between mileposts 196 and 196.8. Key-31 would be located 815 feet west of the 2009 proposed route segment and would be 0.10 mile longer. Field surveys did not find any cultural resource or paleontological sites along either route. Both Key-31 and the 2009 proposed route segment would cross forested/woodlands (sparsely wooded draws) between mileposts 197 and 197.5. KEY-31 would not cross three USGS streams. MDEQ selected KEY-31 to facilitate construction across rough terrain south of the Yellowstone River crossing.

**TABLE I-2.4.3-18**
**Comparison of Keystone Realignment 28 (KEY-28) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-28 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-28 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.85 | 0.86 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.02 | 0.05 | -0.03 |
| Developed | 0.02 | 0.01 | +0.01 | ≥ 5% and ≤ 15% | 0.57 | 0.55 | +0.02 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.23 | 0.25 | -0.02 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.03 | 0.01 | +0.02 |
| Total | 0.02 | 0.01 | +0.01 | **Water Wells within 100 ft** | 0 | 1 | -1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.26 | 0.29 | -0.03 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.59 | 0.57 | +0.02 | **Structures** | | | |
| Total | 0.85 | 0.86 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.85 | 0.86 | -0.01 | Cultural Findings (% Surveyed) | 1 Elg. (100%) | 1 Elg. (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 0.85 | 0.86 | -0.01 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Additional USGS Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Total | 0 | 0 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $1,785,000 | $1,806,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculation of differences.

**TABLE I-2.4.3-19**
**Comparison of Keystone Realignment 29 (KEY-29) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | 2009 Proposed Route Segment (Miles of Land Crossed, except where noted) | KEY-29 | Difference | Item | 2009 Proposed Route Segment (Miles of Land Crossed, except where noted) | KEY-29 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 3.09 | 3.10 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.55 | 0.46 | +0.09 |
| Developed | 0.07 | 0.08 | -0.01 | ≥ 5% and ≤ 15% | 1.96 | 1.89 | +0.07 |
| Forested/ Woodlands | 0.05 | 0.00 | +0.05 | > 15% and ≤ 30% | 0.50 | 0.72 | -0.22 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.08 | 0.03 | +0.05 |
| Total | 0.12 | 0.08 | +0.04 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 2.63 | 2.98 | -0.35 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.46 | 0.12 | +0.34 | **Structures** | | | |
| Total | 3.09 | 3.10 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 3.09 | 3.10 | -0.01 | Cultural Findings (% Surveyed) | 1 Elg., 1 Not Elg. (100%) | 1 Elg., 1 Not Elg. (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 3.09 | 3.10 | -0.01 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 4 | 5 | -1 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 4 | 5 | -1 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 2 | 2 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 2 | 2 | 0 |
| Additional USGS Streams | 6 | 3 | +3 | **Construction Costs** | | | |
| Total | 7 | 4 | +3 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $6,489,000 | $6,510,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-20**
**Comparison of Keystone Realignment 30 (KEY-30) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-30 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-30 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 2.36 | 2.34 | +0.02 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.56 | 1.78 | -0.22 |
| Developed | 0.19 | 0.21 | -0.02 | ≥ 5% and ≤ 15% | 0.80 | 0.56 | +0.24 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.19 | 0.21 | -0.02 | **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.11 | 0.12 | -0.01 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 2.25 | 2.22 | +0.03 | **Structures** | | | |
| Total | 2.36 | 2.34 | +0.02 | Structures within 25 ft | 4 | 0 | +4 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 4 | -4 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 2.36 | 2.34 | +0.02 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 2.36 | 2.34 | +0.02 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 4 | 4 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 4 | 4 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 2 | 1 | +1 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 2 | 1 | +1 | Total Construction Cost | $4,956,000 | $4,914,000 | +$42,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-21**
**Comparison of Keystone Realignment 31 (KEY-31) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-31 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-31 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.79 | 0.89 | -0.10 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.16 | 0.12 | +0.04 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.53 | 0.75 | -0.22 |
| Forested/ Woodlands | 0.05 | 0.05 | 0.00 | > 15% and ≤ 30% | 0.10 | 0.02 | +0.08 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.05 | 0.05 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.79 | 0.89 | -0.10 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 0.00 | 0.00 | 0.00 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.79 | 0.89 | -0.10 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.79 | 0.89 | -0.10 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 0 | 0 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 3 | 0 | +3 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 3 | 0 | +3 | Total Construction Cost | $1,659,000 | $1,869,000 | -$210,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.3.2.21 Keystone Realignment KEY-32 (South of Yellowstone River Realignment)

KEY-32 (see Figure I-2.4.3-16 and Table I-2.4.3-22) was a landowner request to avoid pivot irrigation areas between milepost 197 and milepost 199.5. The realignment would be located 1,750 feet east of the 2009 proposed route segment from milepost 196.8 to milepost 199.5. The realignment would be 0.15 mile shorter than the 2009 proposed route. Both routes would cross developed land in this area, which appears on aerial photography as minor roads.

KEY-32 would cross three more minor roads, but would avoid 0.58 mile of irrigated land on the private properties. Field surveys did not find any cultural resources or paleontological sites along either route. Key-32 would cross one intermittent stream but would avoid crossing one USGS stream. MDEQ selected KEY-32 to address a landowner request to avoid center pivot irrigation areas.

### I-2.4.3.2.22 Keystone Realignment KEY-33 (Cabin Creek Realignment)

KEY-33 (see Figure I-2.4.3-17 and Table I-2.4.3-23) was proposed to avoid crossing dikes and stream crossings around milepost 202. This realignment would be similar to MTV-11. The realignment would be located about 3,000 feet west of the 2009 proposed route segment, from mileposts 200.7 to 203.1. KEY-33 would be 0.10 mile shorter than the 2009 proposed route on private land. The realignment would cross 0.02 mile more of developed land and three additional minor roads, but there would not be any structures within 500 feet. Field surveys did not find any cultural resource or paleontological sites along either route. KEY-33 would cross 0.09 mile less forested/woodlands, no wetlands, one less intermittent stream, and one additional USGS stream. MDEQ selected KEY-33 (see MTV-11 in Section I-2.4.2-11).

### I-2.4.3.2.23 Keystone Realignment KEY-35 (South of McNaney Creek Realignment)

KEY-35 (see Figure I-2.4.3-18 and Table I-2.4.3-24) was proposed to avoid a cliff at milepost 214.4 and a corral at milepost 214.8. The realignment would be located 630 feet east of the 2009 proposed route segment and be 0.01 mile longer, crossing more private land but less BLM land. The 2009 proposed route would be located within 100 feet of one water well. Field surveys did not find any cultural resource or paleontological sites along either route. Both routes would cross one minor road and two intermittent streams. Desktop data indicated that there were two greater sage-grouse leks within 4 miles of both routes and three sharp-tailed grouse leks within 3 miles of both routes. MDEQ selected the western most portion of KEY-35 but widened the approved corridor (see MTV-26 in Section I-2.4.2-26).

### I-2.4.3.2.24 Keystone Realignment KEY-36 (Lawrence Creek Realignment)

KEY-36 (see Figure I-2.4.3-19 and Table I-2.4.3-25) was proposed by a landowner to avoid a reservoir used as a water supply for cattle at milepost 226.7. The realignment would be located 1,400 feet east of the 2009 proposed route segment, from milepost 224.7 to milepost 227.2. KEY-36 would be located within 100 feet of two water wells. Field surveys did not find any cultural resource or paleontological sites along either route. The realignment would avoid forested/woodlands but cross 0.05 mile more wetlands and one more intermittent stream. Desktop data indicated that both routes would be located within 4 miles of three sharp-tailed grouse leks, the closest being about 2.8 miles away. MDEQ selected KEY-36 to address landowner objectives to avoid a reservoir used as a water supply.

**TABLE I-2.4.3-22**
**Comparison of Keystone Realignment 32 (KEY-32) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-32 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-32 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 2.69 | 2.54 | +0.15 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.44 | 1.10 | +0.34 |
| Developed | 0.11 | 0.17 | -0.06 | ≥ 5% and ≤ 15% | 1.24 | 1.41 | -0.17 |
| Forested/ Woodlands | 0.00 | 0.02 | -0.02 | > 15% and ≤ 30% | 0.01 | 0.03 | -0.02 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.11 | 0.19 | -0.08 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.28 | 1.48 | -0.20 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.58 | 0.00 | +0.58 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.83 | 1.06 | -0.23 | **Structures** | | | |
| Total | 2.69 | 2.54 | +0.15 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 2.69 | 2.54 | +0.15 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 2.69 | 2.54 | +0.15 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 4 | 7 | -3 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 4 | 7 | -3 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 1 | -1 | **Construction Costs** | | | |
| Additional USGS Streams | 1 | 0 | +1 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 1 | 1 | 0 | Total Construction Cost | $5,649,000 | $5,334,000 | +$315,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-23**
**Comparison of Keystone Realignment 33 (KEY-33) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-33 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-33 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 2.41 | 2.31 | +0.10 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.51 | 0.98 | +0.53 |
| Developed | 0.06 | 0.08 | -0.02 | ≥ 5% and ≤ 15% | 0.90 | 1.11 | -0.21 |
| Forested/ Woodlands | 0.15 | 0.06 | +0.09 | > 15% and ≤ 30% | 0.00 | 0.22 | -0.22 |
| Wetlands | 0.04 | 0.00 | +0.04 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.25 | 0.14 | +0.11 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.77 | 1.45 | -0.68 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.64 | 0.86 | +0.78 | **Structures** | | | |
| Total | 2.41 | 2.31 | +0.10 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 1 | 0 | +1 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 2.41 | 2.31 | +0.10 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 2.41 | 2.31 | +0.10 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 3 | 6 | -3 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 3 | 6 | -3 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 2 | 1 | +1 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 1 | -1 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 2 | 2 | 0 | Total Construction Cost | $5,061,000 | $4,581,000 | +$480,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-24**
**Comparison of Keystone Realignment 35 (KEY-35) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-35 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-35 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.13 | 1.14 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.33 | 0.37 | -0.04 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.79 | 0.77 | +0.02 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.01 | 0.00 | +0.01 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 1 | 0 | +1 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.13 | 1.14 | -0.01 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures** | | | |
| Total | 1.13 | 1.14 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.13 | 0.22 | -0.09 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 1.00 | 0.92 | +0.08 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.13 | 1.14 | -0.01 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 1 | 1 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 1 | 1 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 2 | 2 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 2 | 2 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 3 | 3 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Intermittent Streams | 2 | 2 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 2 | 2 | 0 | Total Construction Cost | $2,373,000 | $2,394,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-25**
**Comparison of Keystone Realignment 36 (KEY-36) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-36 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-36 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 2.55 | 2.57 | -0.02 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.68 | 0.99 | -0.31 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 1.79 | 1.58 | +0.21 |
| Forested/ Woodlands | 0.002 | 0.00 | +0.002 | > 15% and ≤ 30% | 0.08 | 0.00 | +0.08 |
| Wetlands | 0.11 | 0.16 | -0.05 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.112 | 0.16 | -0.048 | **Water Wells within 100 ft** | 0 | 2 | -2 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.24 | 1.51 | -0.27 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 1 | 1 | 0 |
| Hay Land | 1.31 | 1.06 | +0.25 | **Structures** | | | |
| Total | 2.55 | 2.57 | -0.02 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 2.55 | 2.57 | -0.02 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 2.55 | 2.57 | -0.02 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 3 | 3 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 3 | 3 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 3 | 3 | 0 |
| Intermittent Streams | 1 | 2 | -1 | **Construction Costs** | | | |
| Additional USGS Streams | 1 | 1 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 2 | 3 | -1 | Total Construction Cost | $5,355,000 | $5,397,000 | -$42,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

### I-2.4.3.2.25 Keystone Realignment KEY-37 (North of Pennel Creek Realignment)

KEY-37 (see Figure I-2.4.3-19 and Table I-2.4.3-26) was proposed by a landowner to avoid a road used in transporting farm equipment to pastures, fences that might isolate cattle during construction, rough terrain near milepost 229.5, and the pipeline proximity to a dam used as a reservoir. The realignment would be located 3,350 feet east of the 2009 proposed route segment. It would be the same length as the 2009 proposed route segment, would cross 0.05 mile of state land and 1.15 miles of BLM land, but would cross 1.20 miles less private land. Field surveys found that both routes would cross one non-eligible cultural resource, but no paleontological sites. KEY-37 would not cross forested/woodlands, 0.06 mile less wetlands, and five fewer USGS streams. Desktop data indicated that both routes would be located within 4 miles of one greater sage-grouse lek, which would be screened from view of the pipeline by topography, and four sharp-tailed grouse leks. KEY-37 would be about 0.3 mile farther away from the nearest sharp-tailed grouse lek. MDEQ selected KEY-37 to address landowner objectives, as stated above.

### I-2.4.3.2.26 Keystone Realignment KEY-39 (South of Pennel Creek Realignment)

KEY-39 (see Figure I-2.4.3-20 and Table I-2.4.3-27) was proposed by Keystone to change the route through pump station 14, from mileposts 236.2 to 236.7. The realignment would be 0.01 mile longer than the 2009 proposed segment, and cross 0.02 mile less BLM land but more private land. Field surveys did not find cultural resource or paleontological sites along either route. Field surveys also did not find any wetlands or noxious weed areas. Desktop data indicated that there were four greater sage-grouse leks within 3 miles of both routes, and this was confirmed during field surveys. Topography screens the leks from KEY-39 and the corresponding segment of the 2009 route. MDEQ selected KEY-39 to improve the approach to the proposed pump station 14, to accommodate the Planned Bakken Marketlink Project installation.

### I-2.4.3.2.27 Keystone Realignment KEY-40 (North of Hidden Water Creek Realignment)

KEY-40 (see Figure I-2.4.3-21 and Table I-2.4.3-28) was proposed by Keystone to avoid rough terrain from mileposts 252.1 to 255.7. The realignment would be 0.04 mile longer than the 2009 proposed route segment it would replace, and would cross 0.34 mile of BLM land. Field surveys found that KEY-40 would cross one significant paleontological site, and that neither route would cross any cultural resources. KEY-40 would cross one intermittent stream and four fewer USGS streams, but would be located closer to two small reservoirs and across an old breached reservoir. Field surveys also found that the realignment would cross one noxious weed area. Desktop data indicated that there were five greater sage-grouse leks within 4 miles of the route segment and six leks for the realignment. Field surveys confirmed that there were three greater sage-grouse leks within 3 miles of each route. MDEQ selected KEY-40 in order to avoid steep terrain while also crossing more public land.

**TABLE I-2.4.3-26**
**Comparison of Keystone Realignment 37 (KEY-37) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-37 | Difference |
|---|---|---|---|
| **Length** | 4.09 | 4.09 | 0.00 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.12 | 0.00 | +0.12 |
| Wetlands | 0.08 | 0.02 | +0.06 |
| Total | 0.20 | 0.02 | +0.18 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 3.75 | 3.78 | -0.03 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.34 | 0.31 | +0.03 |
| Total | 4.09 | 4.09 | 0.00 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.05 | -0.05 |
| Private Land | 4.09 | 2.89 | +1.20 |
| U.S. Bureau of Land Management | 0.00 | 1.15 | -1.15 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 4.09 | 4.09 | 0.00 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 4 | 2 | +2 |
| Total | 4 | 2 | +2 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 2 | 2 | 0 |
| Additional USGS Streams | 6 | 1 | +5 |
| Total | 8 | 3 | +5 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-37 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 1.07 | 0.85 | +0.22 |
| ≥ 5% and ≤ 15% | 2.35 | 2.99 | -0.64 |
| > 15% and ≤ 30% | 0.58 | 0.25 | +0.33 |
| > 30% | 0.09 | 0.00 | +0.09 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Not Elg. (100%) | 1 Not Elg. (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 1 | 1 | 0 |
| Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 4 miles | 4 | 4 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $8,589,000 | $8,589,000 | $0 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-27**
**Comparison of Keystone Realignment 39 (KEY-39) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-39 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-39 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 0.56 | 0.57 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.06 | 0.02 | +0.04 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.36 | 0.17 | +0.19 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.14 | 0.24 | -0.10 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.14 | -0.14 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.46 | 0.51 | -0.05 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.10 | 0.06 | +0.04 | **Structures** | | | |
| Total | 0.56 | 0.57 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 0.49 | 0.52 | -0.03 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.07 | 0.05 | +0.02 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.56 | 0.57 | -0.01 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 4 | 4 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 4 | 4 | 0 |
| Total | 1 | 1 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Biology (survey data)** | | | |
| Additional USGS Streams | 0 | 0 | 0 | Biological Resources (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Total | 0 | 0 | 0 | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $1,176,000 | $1,197,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-28**
**Comparison of Keystone Realignment 40 (KEY-40) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-40 | Difference |
|---|---|---|---|
| **Length** | 3.58 | 3.62 | -0.04 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 3.36 | 3.41 | -0.05 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.22 | 0.21 | +0.01 |
| Total | 3.58 | 3.62 | -0.04 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 3.58 | 3.28 | +0.30 |
| U.S. Bureau of Land Management | 0.00 | 0.34 | -0.34 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 3.58 | 3.62 | -0.04 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 0 | 0 | 0 |
| Intermittent Streams | 0 | 1 | -1 |
| Additional USGS Streams | 5 | 1 | +4 |
| Total | 5 | 2 | +3 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-40 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 0.92 | 0.60 | +0.32 |
| ≥ 5% and ≤ 15% | 2.36 | 2.55 | -0.19 |
| > 15% and ≤ 30% | 0.30 | 0.47 | -0.17 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 1 Sig. (100%) | -1 Sig. |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 1 | 1 | 0 |
| Sage-grouse Leks within 3 miles | 3 | 3 | 0 |
| Sage-grouse Leks within 4 miles | 5 | 6 | -1 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 3 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 4 miles | 1 | 1 | 0 |
| **Biology (survey data)** | | | |
| Biological Resources (% Surveyed) | 0 (100%) | 1 Noxious Weed (100%) | -1 Noxious Weed |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $1,176,000 | $1,197,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

#### I-2.4.3.2.28 Keystone Realignment KEY-41 (Little Beaver Creek Realignment)

KEY-41 (see Figure I-2.4.3-22 and Table I-2.4.3-29) was proposed by Keystone to avoid construction near a pond at milepost 264.5. The realignment would be located 480 feet west of the 2009 proposed route segment, from mileposts 262.7 to 266.5. KEY-41 would be 0.01 mile longer than the proposed segment, and both routes would cross one minor road. Field surveys found that KEY-41 would cross one more non-significant paleontological site, and that neither route would cross any cultural resources. KEY-41 also would cross one additional USGS stream, but both routes would cross one intermittent stream. Desktop data indicated both routes would be located within 4 miles of one greater sage-grouse lek. This lek would be over a ridge and visually screened from both the 2009 route and Key-41. It is interesting to note that this sage-grouse lek appears to be located on top of or very close to an older pipeline. MDEQ selected KEY-41 to avoid construction near a pond.

#### I-2.4.3.2.29 Keystone Realignment KEY-45 (North Fork Coal Bank Creek Realignment)

KEY-45 (see Figure I-2.4.3-23 and Table I-2.4.3-30) was proposed by a landowner to avoid construction near natural springs at mileposts 275.1 and 275.7. KEY-45 would be located 820 feet east of the 2009 proposed route segment, from mileposts 274.1 to 275.9, and would be about 0.01 mile longer. Field surveys did not find cultural resource or paleontological sites along either route. Both routes would cross one intermittent stream and one USGS stream. MDEQ selected KEY-45 to address the landowner concern and to avoid crossing an area with springs.

#### I-2.4.3.2.30 Keystone Realignment KEY-46 (South Fork Coal Bank Creek Realignment)

KEY-46 (see Figure I-2.4.3-24 and Table I-2.4.3-31) was proposed to cross South Fork Coal Bank Creek and Box Elder Creek at preferred locations where there would be more gentle slopes on the banks. The realignment would be from mileposts 277.9 to 281.6 and about 0.21 mile shorter than the 2009 proposed route segment on private land. Both routes would cross two minor roads and field surveys found that both routes would cross one non-eligible cultural resource but no paleontological sites. Both routes also would cross one perennial stream and one intermittent stream. Desktop data indicated that both routes would be located within 4 miles of one greater sage-grouse lek.

Two landowners who would be potentially impacted by this realignment had objections because it would cross more cultivated land and be closer to buildings and a residence. MTV-19a was developed in response to this realignment by the landowners and MDEQ to have a more preferred crossing of South Fork Coal Bank Creek and Box Elder Creek, and incorporate the landowners' concerns mentioned previously. MDEQ did not select KEY-46 (see MTV-19a in Section I-2.4.2-19a).

#### I-2.4.3.2.31 Keystone Realignment KEY-47 (Boxelder Creek Realignment)

KEY-47 (see Figure I-2.4.3-24 and Table I-2.4.3-32) was proposed by Keystone to shorten the route and to move the crossing of the tributary to Box Elder Creek to a location without steep banks in South Dakota. The realignment would be 0.04 mile shorter and would be located 800 feet west of the 2009 proposed route segment, from mileposts 281.8 to 282.5 in Montana. Many of the comparisons in Table I-2.4.3-32 stop at the Montana/South Dakota border, and are noted with an asterisk. Field surveys did not find cultural resources or paleontological sites along either route. Both routes would cross one USGS stream and desktop data indicated that they would be within 3 miles of one greater sage-grouse lek. Field surveys verified the greater sage-grouse lek from desktop data and identified six additional greater sage-grouse leks within 3 miles of both routes in Harding County, South Dakota. MDEQ selected KEY-47 to shorten the length and connect to the alignment in South Dakota that avoids steep streamside banks.

#### I-2.4.3.2.32 Keystone Realignment KEY-48 (South Fork Shade Creek Variation)

KEY-48 (see Figure I-2.4.3-11 and Table I-2.4.3-32) was a MDEQ and BLM request to avoid a steep butte on BLM land. MDEQ and Keystone examined the possibility of horizontally boring this steep butte but found that elevation differences on each side of the butte posed challenges to such a bore. In addition, construction equipment would still need to be moved around the butte. Consequently, Keystone developed a variation that would address these concerns. The variation from mileposts 114.3 to 115.6 would be about 0.29 mile longer than the 2009 proposed route segment it would replace. KEY-48 would cross 0.37 mile more of BLM land but 0.08 mile less of private land. Field surveys found that KEY-48 would cross one potentially eligible cultural resource but that one non-significant paleontological site was identified on the 2009 proposed route. Additionally, field surveys found one noxious weed area on the 2009 proposed route. Desktop data indicated that there were three greater sage-grouse leks within 4 miles of both routes, which were verified by field surveys. MDEQ selected KEY-48 to address terrain and access issues.

**TABLE I-2.4.3-29**
**Comparison of Keystone Realignment 41 (KEY-41) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | 2009 Proposed Route Segment | KEY-41 | Difference | Item | 2009 Proposed Route Segment | KEY-41 | Difference |
|---|---|---|---|---|---|---|---|
| | Miles of Land Crossed (except where noted) | | | | Miles of Land Crossed (except where noted) | | |
| **Length** | 3.80 | 3.81 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 1.55 | 1.39 | +0.16 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 2.18 | 2.34 | -0.16 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.07 | 0.08 | -0.01 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 2.68 | 2.69 | -0.01 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 1.12 | 1.12 | 0.00 | **Structures** | | | |
| Total | 3.80 | 3.81 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 3.80 | 3.81 | -0.01 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 1 Not Sig. (100%) | 2 Not Sig. (100%) | -1 Not Sig. |
| Local Government | 0.00 | 0.00 | 0.00 | | | | |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 3.80 | 3.81 | -0.01 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Minor Roads | 1 | 1 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Total | 1 | 1 | 0 | Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Additional USGS Streams | 0 | 1 | -1 | **Construction Costs** | | | |
| Total | 1 | 2 | -1 | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $3,969,000 | $3,990,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-30**
**Comparison of Keystone Realignment 45 (KEY-45) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-45 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-45 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.89 | 1.90 | -0.01 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.52 | 0.51 | +0.01 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 1.16 | 1.21 | -0.05 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.17 | 0.17 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.04 | 0.01 | +0.03 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 1.55 | 1.56 | -0.01 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.34 | 0.34 | 0.00 | **Structures** | | | |
| Total | 1.89 | 1.90 | -0.01 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 1.89 | 1.90 | -0.01 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 1.89 | 1.90 | -0.01 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Minor Roads | 0 | 0 | 0 | Sage-grouse Leks within 4 miles | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 1 | 1 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 2 | 2 | 0 | Total Construction Cost | $3,969,000 | $3,990,000 | -$21,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-31**
**Comparison of Keystone Realignment 46 (KEY-46) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-46 | Difference |
|---|---|---|---|
| **Length** | 3.74 | 3.53 | +0.21 |
| **Land Cover** | | | |
| Developed | 0.00 | 0.00 | 0.00 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 |
| Wetlands | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 |
| **Revenue Final Land Unit Classification** | | | |
| Range Land | 2.81 | 2.00 | +0.81 |
| Irrigated Land | 0.00 | 0.00 | 0.00 |
| Hay Land | 0.93 | 1.53 | -0.60 |
| Total | 3.74 | 3.53 | +0.21 |
| **Land Ownership** | | | |
| State of Montana | 0.00 | 0.00 | 0.00 |
| Private Land | 3.74 | 3.53 | +0.21 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 |
| Local Government | 0.00 | 0.00 | 0.00 |
| ROW | 0.00 | 0.00 | 0.00 |
| Total | 3.74 | 3.53 | +0.21 |
| **Number of Road Crossings** | | | |
| Major Roads | 0 | 0 | 0 |
| Minor Roads | 2 | 2 | 0 |
| Total | 2 | 2 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | |
| Perennial Streams | 1 | 1 | 0 |
| Intermittent Streams | 1 | 1 | 0 |
| Additional USGS Streams | 0 | 0 | 0 |
| Total | 2 | 2 | 0 |

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-46 | Difference |
|---|---|---|---|
| **Slope** | | | |
| < 5% | 2.51 | 2.32 | +0.19 |
| ≥ 5% and ≤ 15% | 1.17 | 1.20 | -0.03 |
| > 15% and ≤ 30% | 0.06 | 0.01 | +0.05 |
| > 30% | 0.00 | 0.00 | 0.00 |
| **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Residences** | | | |
| Residences within 25 ft | 0 | 0 | 0 |
| Residences within 500 ft | 0 | 0 | 0 |
| **Structures** | | | |
| Structures within 25 ft | 0 | 0 | 0 |
| Structures within 500 ft | 0 | 0 | 0 |
| **Cultural Resources (Class III)** | | | |
| Cultural Findings (% Surveyed) | 1 Not Elg. (100%) | 1 Not Elg. (100%) | 0 |
| Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| **Grouse (desktop data)** | | | |
| Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 3 miles | 0 | 0 | 0 |
| Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| **Construction Costs** | | | |
| Cost per mile | $2,100,000 | $2,100,000 | |
| Total Construction Cost | $7,854,000 | $7,413,000 | +$441,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

**TABLE I-2.4.3-32**
**Comparison of Keystone Realignment 47 (KEY-47) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-47 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-47 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.82 | 1.78 | +0.04 | **Slope*** | | | |
| **Land Cover** | | | | < 5% | 0.60 | 0.98 | -0.38 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 1.02 | 0.72 | +0.30 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.20 | 0.08 | +0.12 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.00 | 0.00 | 0.00 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft*** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification*** | | | | **Residences*** | | | |
| Range Land | 0.52 | 0.58 | -0.06 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.00 | 0.00 | 0.00 | **Structures*** | | | |
| Total | 0.52 | 0.58 | -0.06 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership*** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources* (Class III)** | | | |
| Private Land | 0.52 | 0.58 | -0.06 | Cultural Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| U.S. Bureau of Land Management | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 0 (100%) | 0 (100%) | 0 |
| Local Government | 0.00 | 0.00 | 0.00 | **Grouse* (desktop data)*** | | | |
| ROW | 0.00 | 0.00 | 0.00 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| Total | 0.52 | 0.58 | -0.06 | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 2 miles | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 3 miles | 1 | 1 | 0 |
| Minor Roads | 0 | 0 | 0 | Sage-grouse Leks within 4 miles | 1 | 1 | 0 |
| Total | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Intermittent Streams | 0 | 0 | 0 | **Construction Costs** | | | |
| Additional USGS Streams | 1 | 1 | 0 | Cost per mile | $2,100,000 | $2,100,000 | |
| Total | 1 | 1 | 0 | Total Construction Cost | $3,822,000 | $3,738,000 | +$84,000 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences. *Data sources only available in Montana.
* These resource comparisons stop at the Montana/South Dakota border at about one-half mile.

**TABLE I-2.4.3-33**
**Comparison of Keystone Realignment 48 (KEY-48) with the Proposed Segment of the 2009 Route it Would Replace**

| Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-48 | Difference | Item | Miles of Land Crossed (except where noted) 2009 Proposed Route Segment | KEY-48 | Difference |
|---|---|---|---|---|---|---|---|
| **Length** | 1.31 | 1.60 | -0.29 | **Slope** | | | |
| **Land Cover** | | | | < 5% | 0.49 | 0.56 | -0.07 |
| Developed | 0.00 | 0.00 | 0.00 | ≥ 5% and ≤ 15% | 0.62 | 0.94 | -0.32 |
| Forested/ Woodlands | 0.00 | 0.00 | 0.00 | > 15% and ≤ 30% | 0.17 | 0.10 | +0.07 |
| Wetlands | 0.00 | 0.00 | 0.00 | > 30% | 0.03 | 0.00 | +0.03 |
| Total | 0.00 | 0.00 | 0.00 | **Water Wells within 100 ft** | 0 | 0 | 0 |
| **Revenue Final Land Unit Classification** | | | | **Residences** | | | |
| Range Land | 0.87 | 1.25 | -0.38 | Residences within 25 ft | 0 | 0 | 0 |
| Irrigated Land | 0.00 | 0.00 | 0.00 | Residences within 500 ft | 0 | 0 | 0 |
| Hay Land | 0.44 | 0.35 | +0.09 | **Structures** | | | |
| Total | 1.31 | 1.60 | -0.29 | Structures within 25 ft | 0 | 0 | 0 |
| **Land Ownership** | | | | Structures within 500 ft | 0 | 0 | 0 |
| State of Montana | 0.00 | 0.00 | 0.00 | **Cultural Resources (Class III)** | | | |
| Private Land | 1.00 | 0.92 | +0.08 | Cultural Findings (% Surveyed) | 0 (100%) | 1 Pot. Elg. (100%) | -1 Pot. Elg. |
| U.S. Bureau of Land Management | 0.31 | 0.68 | -0.37 | | | | |
| Local Government | 0.00 | 0.00 | 0.00 | Paleo Findings (% Surveyed) | 1 Not Sig. (100%) | 0 (100%) | +1 Not Sig. |
| ROW | 0.00 | 0.00 | 0.00 | **Grouse (desktop data)** | | | |
| Total | 1.31 | 1.60 | -0.29 | Sage-grouse Core Area crossed | 0 | 0 | 0 |
| **Number of Road Crossings** | | | | Sage-grouse Leks within 1 mile | 0 | 0 | 0 |
| Major Roads | 0 | 0 | 0 | Sage-grouse Leks within 2 miles | 1 | 1 | 0 |
| Minor Roads | 2 | 2 | 0 | Sage-grouse Leks within 3 miles | 2 | 2 | 0 |
| Total | 2 | 2 | 0 | Sage-grouse Leks within 4 miles | 3 | 3 | 0 |
| **Number of Railroad Crossings** | 0 | 0 | 0 | Sharp-tailed Leks within 1 mile | 0 | 0 | 0 |
| **Number of Stream Crossings** | | | | Sharp-tailed Leks within 2 miles | 0 | 0 | 0 |
| Perennial Streams | 0 | 0 | 0 | Sharp-tailed Leks within 3 miles | 0 | 0 | 0 |
| Intermittent Streams | 1 | 1 | 0 | Sharp-tailed Leks within 4 miles | 0 | 0 | 0 |
| Additional USGS Streams | 3 | 4 | -1 | **Biology (survey data)** | | | |
| Total | 4 | 5 | -1 | Biological Resources (% Surveyed) | 1 Noxious Weed (100%) | 0 (100%) | + 1 Noxious Weed |
| | | | | **Construction Costs** | | | |
| | | | | Cost per mile | $2,100,000 | $2,100,000 | |
| | | | | Total Construction Cost | $2,751,000 | $3,360,000 | -$609,000 |
| | | | | Environmental Mitigation Cost | $7,120 | $10,000 | -$2,880 |

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

## I-2.5 PREFERRED ROUTE IN MONTANA

MDEQ identified and assessed potential alternatives for the proposed Keystone XL Project in Montana. Those assessments included consideration of the No Action Alternative (Section 4.1 of the EIS and Section I-2.2), the system and route alternatives presented in Sections 4.2 and 4.3 of the EIS, and the route alternatives identified in Section I-2.3. During the screening process it was determined that the identified alternatives were either not considered reasonable or did not offer a significant environmental advantage over the proposed Project route (Alternative SCS-B) and were therefore eliminated from further evaluation. However, in Section I-2.4.2, MDEQ identified 50 variations to the proposed route that would increase the use of public land where economically as practicable as the use of private land (as required by MFSA), avoid or minimize impacts to specific resources, avoid or minimize conflicts with existing or proposed residential and agricultural land uses, or respond to requests submitted by concerned landowners. In addition, in Section I-2.4.3 Keystone indentified 48 realignments to the proposed route that would avoid or minimize impacts to specific resources. The 16 realignments less than 250 feet (see Table I-2.4.3-1) were not evaluated as part of MDEQ's preferred route but additional room would be provided (see Attachment 1, Environmental Specifications, Appendix E). However, two realignments less than 250 feet were combined with preferred route variations, including KEY-25 as part of MTV-5a (see Section I-2.4.2-5a) and KEY-34 as part of MTV-11 (see Section I-2.4.2-11).

After evaluating the 50 variations (MTVs), MDEQ determined that 23 of the variations were preferable to the segments of the proposed route they would replace (see Sections I-2.4.2-1 through I-2.4.2-30 and Figures I-2.4.2-1 through I-2.4.2-24). The Montana route variations selected consist of the following:

- MTV-5a (combined with KEY-25)
- MTV-6
- MTV-6a
- MTV-6b
- MTV-6c
- MTV-9e (southern 1.5 miles)
- MTV-9g
- MTV-10
- MTV-11(combined as KEY-33 and KEY-34)
- MRV-15
- MTV-17
- MTV-19a
- MTV-20
- MTV-21
- MTV-22 (combined with KEY-16)
- MTV-23
- MTV-24
- MTV-25

- MTV-26 (combined with KEY-35)
- MTV-27
- MTV-28
- MTV-29
- MTV-30

After evaluating the 32 Keystone realignments (KEYs) greater than 250 feet, MDEQ determined that 25 of the realignments were preferable to the segments of the proposed route that they would replace (see Sections I-2.4.3-1 through I-2.4.3-32 and Figures I-2.4.3-1 through I-2.4.3-24). The Keystone realignments selected consist of the following:

- KEY-1
- KEY-2 (combined with MTV-30)
- KEY-3 (combined with MTV-30)
- KEY-4
- KEY-6
- KEY-8
- KEY-12
- KEY-15
- KEY-16 (southern 1.1 miles, combined with MTV-22)
- KEY-17
- KEY-21 (portion north of KEY-48)
- KEY-24
- KEY-30
- KEY-31
- KEY-32
- KEY-33 (northern portion of MTV-11)
- KEY-35 (western portion, combined with MTV-26)
- KEY-36
- KEY-37
- KEY-39
- KEY-40
- KEY-41
- KEY-45
- KEY-47
- KEY-48

As a result, MDEQ has selected the proposed Project route (Alternative SCS-B), as modified by the variations and realignments listed above, as the preferred alternative route in Montana. Figure I-2.5-1 depicts that route. This route is approximately 285.5 miles long in Montana, with approximately 72.7 miles of variations and 45.0 miles realignments replacing proposed route segments.

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## I-3.0 ENVIRONMENTAL ANALYSIS OF THE PROPOSED KEYSTONE XL PROJECT IN MONTANA

The overall approach used to assess the impacts of the proposed Project is presented in Section 3.0 of the EIS. The sections of the EIS listed below present discussions about the potential impacts of the proposed Project that comply with MEPA requirements and provide supporting information for the determinations under MFSA:

- Geology (Section 3.1);
- Soils and Sediments (Section 3.2);
- Threatened and Endangered Species (Section 3.8);
- Cultural Resources (Section 3.11);
- Risk Analysis and Environmental Consequences (Section 3.13); and
- Cumulative Impacts (Section 3.14).

The DOS EIS also provides information required by MEPA and supporting information for the determinations under MFSA for Water Resources; Wetlands; Terrestrial Vegetation; Wildlife; Fisheries; Land Use, Recreation, and Visual Resources; Socioeconomics; and Air Quality and Noise. This appendix provides supplemental information for those resource areas in the following sections:

- Water Resources (Section I-3.1);
- Wetlands (Section I-3.2);
- Terrestrial Vegetation (Section I-3.3);
- Wildlife (Section I-3.4);
- Fisheries (Section I-3.5);
- Land Use, Recreation, and Visual Resources (Section I-3.6);
- Socioeconomics (Section I-3.7); and
- Air Quality and Noise (Section I-3.8).

In some cases, information from the DOS EIS has been repeated in this appendix to provide continuity with the discussion about existing conditions and the potential environmental impacts of the proposed Project. It should be noted that this section of the appendix provides an overview of the affected environment and potential impacts of the original 2009 Keystone proposed pipeline alignment. Detailed review of the potentially affected resources of the 2010 Keystone proposed realignments and the 2010 and 2011 MDEQ proposed variations were presented in the previous section.

As stated in Section 3.0 of the EIS, the environmental consequences of constructing and operating the proposed Project could be adverse or beneficial and would vary in duration and magnitude. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction, with the resources returning to pre-construction conditions almost immediately afterward. Short-term impacts could continue for approximately three years following construction. Impacts were considered long term if the resources would require more than three years to recover. Permanent impacts would occur as a result of activities that modified resources to the extent that they would not return to pre-construction conditions during the life of the proposed Project, such as with construction of aboveground structures. An impact resulting in a substantial adverse change in the environment would be considered significant.

The sections below address the affected environment, construction and operations impacts, and mitigation, where appropriate. Keystone has indicated that it would implement certain measures to reduce environmental impacts. These measures have been evaluated and additional measures that might be necessary to further reduce impacts are recommended. In addition, MDEQ has developed its Environmental Specifications to provide additional mitigation to potential impacts; those specifications are included in this appendix as Attachment 1.

Conclusions in this appendix are based on analyses of environmental impacts and the following assumptions:

- Keystone would comply with all applicable laws and regulations;
- The proposed facilities would be constructed as described in Section 2.0 of the EIS;
- Keystone would implement the measures designed to avoid or minimize impacts that are described in its application to MDEQ for a MFSA certificate and in supplemental filings to that application;
- Keystone would implement the measures designed to avoid or minimize impacts that are described in its Environmental Report and supplemental filings to DOS, including its Construction, Mitigation, and Reclamation (CMR) Plan (presented in Appendix B to the EIS); and
- Keystone would implement the required measures presented in the MDEQ Environmental Specifications presented in Attachment 1 to this appendix.

As noted in Section I-1.0, information regarding the proposed Project (e.g., design, location, schedule, workforce, miles of specific types of land crossed, and other details needed to conduct an environmental assessment of the proposed Project) was obtained from four main sources: (1) Keystone's application for a MFSA Certificate of Compliance and subsequent submittals associated with the application, (2) Keystone's application for a Presidential Permit and associated submittals to DOS, (3) Keystone's proposed Plan of Development for a ROW grant from the Bureau of Land Management (BLM), and (4) Keystone's supplemental information for Section 2 of the EIS, Project Description. Information from those sources is not specifically cited in the following sections.

In addition, limited field work was conducted by MDEQ staff. Information about the existing environment in Montana that was included in the documents submitted by Keystone was partially reviewed for accuracy by MDEQ, and the documents were reviewed for accuracy by the third-party environmental contractor to DOS and MDEQ. Where appropriate, information from those documents was used in this impact analysis section. Information about existing conditions and potential environmental impacts associated with implementation of the proposed Project was also obtained from literature research and field studies conducted by the third-party environmental contractor, from MDEQ and MFWP sources of information publicly available in Montana, and from MDEQ files and knowledge of the area in the vicinity of the routes of the proposed Project and the alternatives.

## I-3.1 WATER RESOURCES

Section 3.3 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on water resources, including information for Montana. Section I-3.1.1 provides site-specific information about selected waterbody crossings in

Montana, in accordance with the provisions of MEPA and MFSA, and Section I-3.1.2 addresses floodplains along the proposed route in Montana.

## I-3.1.1 WATERBODIES

Prior to making a decision under MFSA and the Montana Water Quality Act (75-5-318, MCA), MDEQ must conduct a review of stream crossings for Keystone's proposed route and make a determination on its Joint Application 318 Authorization. Under MFSA, that decision must be made concurrently with a decision on Keystone's application for a MFSA Certificate of Compliance. The third-party environmental contractor for DOS and MDEQ conducted on-site inspections of selected crossing sites for Keystone's proposed route in Montana and submitted a report about the inspections to MDEQ (*Keystone XL Pipeline Montana Stream Crossing Inspections Report* [SCIR]). That report provides information about the proposed crossing methods, the process used to select crossing sites for field inspection, office and field methods used, and the results of the analyses for each crossing site assessed. It also describes the procedures that Keystone would incorporate into design and construction of the crossings to minimize impacts and potential site-specific mitigation measures for consideration by MDEQ. MDEQ has adopted the SCIR by reference as part of the EIS for the proposed Project.

The information presented below summarizes key aspects of the SCIR, the measures that Keystone would incorporate into the proposed Project to avoid or minimize impacts, and the mitigation measures that MDEQ would require as a part of its Environmental Specifications for the proposed Project (see Attachment 1 to this appendix) to minimize the impacts of stream crossings in Montana. In addition, a draft of the MDEQ requirements for the 318 Authorization is presented in Attachment 2 of this appendix.

### I-3.1.1.1 Methods and Analyses

### Waterbody Crossings for Analysis

The proposed pipeline would cross a total of 389 waterbodies in Montana. Of that total, MDEQ selected 55 crossing sites for detailed review because they met at least one of the following criteria:

- The proposed route crossed a perennial stream;
- The proposed crossing site was within a designated floodplain of the state;
- The proposed route crossed a waterbody containing fish designated as Species of Concern to the state or which was known to include the habitats of those fish species; or
- The proposed route crossed a stream of special interest to the state.

Of the 55 crossings in Montana that required further review, 20 are perennial streams and 35 are intermittent streams. All 20 perennial stream crossings were inspected in the field. MDEQ required that all 35 proposed crossings of intermittent streams receive a desktop review because of their listing as a potential concern. Proposed intermittent stream crossings were inspected in the field only if they either contained fish Species of Concern or were known to include the habitats of those fish species, or if they were streams of special interest to the state.

Using these criteria, 16 of the reviewed 35 intermittent streams were identified for site inspections. The remaining 19 intermittent stream crossings were evaluated using the in-office analytical procedures described below.

## Analysis of Intermittent Streams Not Field Inspected

Desktop analyses of the proposed crossings were conducted to provide context, background, and support for the field investigations. The analyses included a review of available literature and addressed flood flow and geomorphic characterization of the proposed crossing sites. Flood flow frequency analyses were conducted for each proposed crossing site using a regional regression equation (Omang 1992) to calculate the discharge for the 2-, 5-, 10-, 50-, and 100-year storm recurrence intervals. The nearest gauge station was included in the analysis using Federal Emergency Management Agency's (FEMA) Bulletin 17B method (FEMA 1981). Checks were conducted of arbitrarily selected stations by using either a second flood flow calculation or an exceedance probability curve from historical annual peak flow data. Although the potential for lateral stream migration was examined and documented, scour depths were not calculated.

The geomorphic assessments were conducted using GIS and several sources of data: aerial photographs from 2005; USGS topographic maps in 1:24,000 scale from 1940 to 1995; geologic maps in 1:100,000 scale from the Montana Bureau of Mines and Geology; and digital surface water data from the USGS National Hydrograph Database. Data were obtained for the channels to be crossed and for the surrounding floodplains and valleys. Channel characterization included measurements of the width, form, gradient, and sinuosity of each channel. Valley characteristics examined included the width, gradient, geology, and the presence of landslides or floodplain features such as relict channels. Infrastructure in the vicinity of each crossing, including the presence of in-stream structures, was also catalogued.

The literature review consisted of online searches in Montana's Natural Resource Information System and other state and national agency databases for previous channel migration zone studies. It also included review of reports about hydrology, hydraulics, sediment transport, bridge scour, ice jams, and turbidity.

## Field Methods

Site specific information collected in the field included characterization of stream form and geometry, alluvial substrate, soils, vegetation, evidence of current and previous instability, and natural and artificial disturbance affecting the crossing site. Field maps and valley cross-sections were developed for each proposed crossing site; this included a topographic, geologic, and soils map for each site, as well as current and historic air photos.

Valley cross-sections along the proposed route were developed using USGS 30-minute digital terrain models. This reach-level information was used to place the proposed crossing location in context with the surrounding topography, geology, soils, and hydrology, and to identify natural or artificial disturbances adjacent to the crossing that might affect the crossing site. The results of the flood frequency analyses were used as a check of the field interpretations of the locations and extents of the bankfull channel and recurrence intervals for identified floodplains. Although the potential for lateral stream migration was examined and documented, scour depths were not calculated.

On-site evaluations of each of the crossing sites focused on the following considerations:

- Likelihood that the pipeline crossing as currently designed would withstand stream scour, incision, and lateral stream movement over the life of the proposed Project;
- Likelihood that the proposed crossing method would minimize turbidity during construction and operation; and
- Assessments of the potential environmental effects of the proposed design of the crossings and consideration of potential mitigation of those effects.

### I-3.1.1.2 Affected Environment, Potential Impacts, and Mitigation

The studies conducted for the SCIR indicated that several proposed crossing sites had indicators of bank or other geomorphologic instability, or the presence of geomorphologic features that could lead to future instability. Indicators of instability that could lead to future incision or lateral migration were present at 27 of the 35 crossing sites listed in Table I-3.1-1. Examples of these indicators included areas with nearly vertical banks, areas with actively slumping or undercut banks, areas with side channels on floodplains adjacent to the bank-full channel, and areas with perennial or intermittent in-stream impoundments.

**TABLE I-3.1-1**
**Crossing Sites Inspected to Determine the Potential for Incision or Lateral Migration from Proposed Pipeline Construction in Montana**

| | Concern | | | | |
|---|---|---|---|---|---|
| **Stream** | **Turbidity** | **Incision** | **Channel Migration** | **Consider Adaptive Management Plan** | **Consider Alternative Crossing Technique** |
| Corral Coulee (A) | No | Yes | Yes | Yes | No |
| Corral Coulee (B) | No | Yes | Yes | Yes | No |
| Frenchman Creek | No | Yes | Yes | Yes | Yes |
| Hay Coulee | No | No | No | Yes | No |
| Rock Creek | No | Yes | Yes | Yes | Yes |
| Willow Creek | No | Yes | Yes | Yes | Yes |
| Lime Creek | No | Yes | Yes | Yes | No |
| Brush Fork | No | Yes | Yes | Yes | No |
| Bear Creek | No | Yes | Yes | Yes | No |
| Unger Coulee | No | Yes | Yes | Yes | No |
| Buggy Creek | No | Yes | Yes | Yes | No |
| Spring Creek | No | Yes | Yes | Yes | No |
| Cherry Creek | No | Yes | Yes | Yes | No |
| Spring Coulee | No | Yes | Yes | Yes | No |
| East Fork Cherry Creek | No | Yes | Yes | Yes | No |
| Espeil Coulee | No | Yes | Yes | Yes | No |
| Milk River | No | No | No | No | No |
| Missouri River | No | No | No | No | No |
| West Fork Lost Creek | No | No | No | Yes | Yes |
| Tributary to West Fork Lost Creek | No | No | No | Yes | Yes |
| East Fork Prairie Elk Creek | No | Yes | Yes | Yes | Yes |
| Redwater River | No | Yes | Yes | Yes | Yes |
| Buffalo Springs Creek | No | Yes | Yes | Yes | Yes |
| Berry Creek | No | Yes | Yes | Yes | Yes |
| Clear Creek | No | Yes | No | Yes | Yes |

**TABLE I-3.1-1**
**Crossing Sites Inspected to Determine the Potential for Incision or Lateral Migration from Proposed Pipeline Construction in Montana**

| Stream | Concern: Turbidity | Concern: Incision | Concern: Channel Migration | Consider Adaptive Management Plan | Consider Alternative Crossing Technique |
|---|---|---|---|---|---|
| Side Channel Yellowstone River | No | No | No | No | No |
| Yellowstone River | No | No | No | No | No |
| Cabin Creek (A) | No | Yes | Yes | Yes | Yes |
| Cabin Creek (B) | No | Yes | Yes | Yes | Yes |
| Dry Fork Creek | No | Yes | Yes | Yes | Yes |
| Pennel Creek | No | Yes | Yes | Yes | Yes |
| Little Beaver Creek | No | Yes | Yes | Yes | Yes |
| North Fork Coal Bank Creek | No | No | No | Yes | No |
| South Fork Coal Bank Creek | No | Yes | Yes | Yes | No |
| Boxelder Creek | No | Yes | Yes | Yes | Yes |

For crossings where a field assessment was not conducted, the SCIR provides potential mitigation measures based on the desktop analysis. Potential mitigation measures would include adjustments to the proposed cover depths along the crossing approaches, site reclamation measures, post-construction management plans, and potential preventative protection measures. In some cases, potential adjustments to cover depth would exceed the cover depth maximums included in Keystone's Construction Mitigation and Reclamation Plan (CMR Plan, presented in Appendix B of the EIS). In general, cover depths at stream crossing approaches and the width that these cover depths would be carried laterally would be important for providing a buffer to maintain the integrity of the pipeline if the stream were to migrate during operation of the proposed Project. Additionally, the approach buffer would provide construction workspace for implementation of preventative protection measures, if advisable.

As a potential mitigation measure, the management plan described in the SCIR allows adaptive management procedures to be implemented if indications of potentially troublesome geomorphologic changes in bank, channel, or floodplain configurations were identified during routine pipeline inspections. If such indicators were observed during routine inspections, an assessment would be conducted to identify mechanisms contributing to the instability and the appropriate mitigation measures would be identified and implemented to reduce instability. Possible mitigation measures would include spur dikes, engineered wood structures, bendway weirs, live crib walls, and rock toes. Those procedures would reduce the potential for long-term impacts to the surface waters of Montana crossed by the proposed route.

Preventative protection measures applicable to the evaluated crossings would include spur dikes, engineered wood structures, longitudinal stone toes, longitudinal stone toes with spurs, trench fill revetment, vegetated gabion basket, and soil- and grass-covered riprap. If insufficient workspace was available for placement of preventative protection measures in the floodplain, instream applications would be needed to mitigate channel migration or scour. Applicable preventative instream protection measures would include spur dikes, vanes, bendway weirs, engineered-wood structures, longitudinal stone toes, longitudinal stone toes with spurs, vegetated gabion basket, live crib walls, and soil- and grass-covered riprap.

For crossing sites studied in the field, the SCIR provides potential mitigation measures, such as alternative cover depths and additional post-construction site reclamation measures. The report also includes potential draft management plans that could be instituted to monitor the sites after construction was completed. For a few crossings, the report presents potential alternative crossing locations (route variations, as described Section I-2.4.2) that would reduce the potential for problems resulting from long-term channel geomorphologic instability. These suggested variations were identified to reduce the impacts of crossing a waterbody or to address landowner concerns.

Prior to final design of the permitted proposed Project route in Montana, Keystone would conduct additional engineering assessments of all waterbody crossings. The results of the assessments would be used to design and construct crossings to minimize the short- and long-term impacts of the crossings. At each crossing, the assessment would consider the potential for vertical scour based on substrate type, streamflow during a 100-year flood, the channel cross section, and other factors. Keystone would consider field data and a more in-depth analysis for each stream with a possible scour depth greater than 5 feet. In evaluating the potential for lateral migration, Keystone would include a review of the vertical scour analysis, a linear discriminant analysis, an analysis based on examining evidence of lateral migration, inspection of current and historic aerial photographs, and other relevant factors. The results from the vertical scour and lateral migration assessments would be incorporated into the engineering and design of the crossings, including the method of crossing, depth of crossing, and extra depth extents of the crossing. Additional information about the specific methods and procedures that Keystone would incorporate into the proposed Project to minimize the impacts of waterbody crossings in Montana is presented in Keystone's MFSA application and supplemental submittals to the application.

Implementation of the measures proposed by Keystone to minimize the impacts of waterbody crossings along with the appropriate mitigation measures presented above and in the SCIR, including incorporation of applicable route variations, would help to ensure that maintenance activities that would further disturb the stream channel during operations were minimized.

### I-3.1.2 FLOODPLAINS

Floodplains are relatively low, flat areas of land that surround waterbodies and hold overflows during flood events. Floodplains form where overbank floodwaters spread out laterally and deposit fine-grained sediments. The combination of rich soils, proximity to water, riparian forests, and the dynamic reworking of sediments during floods creates a diverse landscape with high habitat quality.

Changing climatic and land use patterns in much of the western U.S. has resulted in region-wide incision of many stream systems. As these stream systems incise channel cuts deeper into the surrounding floodplains, high floodplain terraces are created along valley margins. These floodplain terraces are common throughout Montana and receive floodwaters less frequently than the adjacent low floodplain next to the rivers.

From a policy perspective, the FEMA defines a floodplain as being any land area susceptible to being inundated by waters from any source (FEMA 2005). FEMA prepares Flood Insurance Rate Maps that delineate the flood hazard areas, such as floodplains, for communities. These maps are used to administer floodplain regulations and to mitigate flood damage. Typically, these maps indicate the locations of the 100-year floodplains, which are the areas with a 1-percent chance of flooding in any single year.

Executive Order 11988, Floodplain Management, states that actions by federal agencies are to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development wherever there is a practicable alternative. Each agency is to provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for: (1) acquiring, managing, and disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

#### I-3.1.2.1 Affected Environment

In Montana, low floodplain terraces occur at many stream crossings. For smaller intermittent and ephemeral drainages, these are typically narrow and infrequently flooded. At crossings of rivers and larger perennial streams, floodplains are generally wider and can flood more frequently than the smaller streams and drainages. Designated floodplains crossed by the proposed route are listed in Table I-3.1-2.

**TABLE I-3.1-2**
**Designated Floodplain Areas Crossed by the Proposed Keystone XL Pipeline Route in Montana**

| County | Approximate Mileposts | Watercourse Associated with Floodplain |
|---|---|---|
| Valley | 81 – 84 | Milk River |
| Valley/McCone | 87 – 90 | Missouri River |
| McCone | 146 – 147 | Redwater River |
| Dawson | 193 – 196 | Yellowstone River |

#### I-3.1.2.2 Potential Impacts and Mitigation

The pipeline would be constructed under river channels having a potential for lateral scour, as described in Section I-3.1.1.5. In floodplain areas adjacent to waterbodies, Keystone would restore the contours to as close to previously existing contours as practical and would revegetate the construction ROW in accordance with its CMR Plan (Appendix B) and the requirements of the MDEQ Environmental Specifications (Attachment 1 to this appendix). Therefore, after construction the pipeline would not obstruct flows over designated floodplains. In addition, there would be no aboveground facilities (pump stations or valves) in floodplains in Montana.

As a result, the proposed Project would not affect floodplains in Montana.

### I-3.1.3 REFERENCES CITED


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### I-3.2 WETLANDS

Section 3.4 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on wetlands, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

Wetland types in the vicinity of the proposed Project in Montana include emergent wetlands, scrub/shrub wetlands, and forested wetlands. Waters in the vicinity of the proposed route include ephemeral, intermittent, and perennial streams and open water (Cowardin et al. 1979). Keystone provided information about specific wetlands along the proposed corridor in Montana in its application for a MFSA Certificate of Compliance (Keystone 2008). Information presented in this appendix describing wetland communities that would be crossed by the proposed route was based on the Keystone reports and additional information in the public records or available from resource agency files.

#### I-3.2.1 AFFECTED ENVIRONMENT

Emergent wetlands with fowl bluegrass (*Poa palustris*) and foxtail barley (*Hordeum jubatum*) dominate areas that typically contain spring snowmelt water for several weeks. In areas where water persists for several months each spring, shallow-marsh vegetation typically includes common spikerush (*Eleocharis palustris*) and wheat sedge (*Carex atherodes*). In areas where water persists throughout the year, deep-marsh vegetation typically includes cattails (*Typha latifolia* and *T. angustifolia*) and hardstem bulrush (*Schoenoplectus acutus*).

Scrub-shrub wetlands are characterized by woody vegetation less than 15 feet tall, which can include shrubs, sapling trees, or stunted trees. Scrub-shrub vegetation can include willows (*Salix* spp.), redosier dogwood (*Cornus sericea*), greasewood (*Sarcobatus vermiculatus*), and fourwing saltbush and shadscale saltbush (*Atriplex canescens* and *A. confertifolia*).

Forested wetlands are characterized by woody vegetation 15 or more feet tall, with common Montana trees including boxelder (*Acer negundo*), plains cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), and peachleaf willow (*Salix amygdaloides*). Common wetland shrubs within forested wetlands include redosier dogwood, Drummond's willow and narrowleaf (sandbar) willow (*Salix drummondiana* and *S. exigua*), silver buffaloberry (*Shepherdia argentea*), and snowberry (*Symphoricarpos* spp.). Exotic trees or shrubs within forested wetlands and riparian areas include Russian olive (*Elaeagnus angustifolia*) and, in limited areas, tamarisk (*Tamarix* spp.). Riparian forests include stands of cottonwood or mixed cottonwood-conifer forests. For the purposes of this analysis, riparian forest areas greater than 300 feet by 30 feet with an average canopy height of 50 feet or more and with more than 20 trees per acre were considered forested wetlands.

A total of 5.3 miles of wetlands would be crossed by the proposed route in Montana (see Table I3.2-1). Section 3.4.2 of the EIS provides information about the wetlands that would be crossed by the proposed Project that are considered of special concern or value, occur within conservation areas and reserves, are wetland easements or wildlife areas, represent sensitive landscapes, or have sensitive wetland vegetation communities.

| TABLE I-3.2-1<br>Wetlands Crossed by the Proposed Project in Montana | | | |
|---|---|---|---|
| **Wetland Type** | **Length of Wetlands Crossed (miles)** | **Wetland Area Affected during Construction (acres) [1]** | **Number of Wetlands Crossed** |
| Emergent Wetlands | 4.2 | 60 | 259 |
| Forested Wetlands [1] | 0.9 | 13 | 27 |
| Scrub-shrub Wetlands | 0.2 | 2 | 7 |

Source: Keystone 2009a.
[1] For the purposes of this analysis, riparian forests 300 feet by 30 feet or larger were classified as forested wetlands.

## I-3.2.2 POTENTIAL IMPACTS AND MITIGATION

Construction of the pipeline would affect wetlands and their functions primarily during and immediately following construction activities, but permanent changes also would be possible. Potential construction- and operations-related effects on wetlands are discussed in Section 3.4.3 of the EIS. The proposed lengths, estimated areas, and numbers of wetlands crossed by the proposed route are summarized in Table I-3.2-1. A list of the wetlands and waterbodies crossed by the proposed route is presented in Appendix E of the EIS. Jurisdictional and non-jurisdictional wetlands would be delineated prior to the issuance of required permits. Impacts to wetlands that are non-jurisdictional under the Clean Water Act (CWA) Section 404 would not require mitigation by the U.S. Army Corps of Engineers.

Keystone's CMR Plan requires that it restore the ROW to near pre-construction conditions, including elevation, grade, and soil structure. As a result, the wetland vegetation communities would, in general, eventually transition back into communities that were functionally similar to those of the wetlands prior to construction. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within three to five years). Following restoration and revegetation, there would be few permanent effects on emergent wetland vegetation because these areas naturally consist of and would remain as herbaceous communities. Herbaceous wetland vegetation in the permanent ROW generally would not be mowed or otherwise maintained, although the Keystone CMR Plan (Appendix B of the EIS) allows for annual maintenance of a 30-foot-wide strip centered over the pipeline. As a result, the impact of construction of the proposed Project on emergent wetlands in Montana would range from short term to long term in duration and be of a minor magnitude, and the impact during operation would be minor but would last for the life of the proposed Project.

In forested and scrub-shrub wetlands (Table I-3.2-2), the effects of construction would extend beyond the three to five-year period needed for emergent wetlands because of the longer period needed to regenerate a mature forest or shrub community. Tree species that typically dominate forested wetlands in the vicinity of the proposed Project in Montana (primarily cottonwood and green ash) have regeneration periods of 10 to 30 years or more. Willows and other non-sagebrush riparian shrubs would likely regenerate within five to 15 years. Trees and shrubs would not be allowed to grow within the maintained ROW except within some portions of the ROW associated with HDD crossings. Therefore, removal of forested and scrub-shrub wetland habitats during pipeline construction would result in minor to moderate impacts to those wetlands for the life of the proposed Project. The maintained ROW would result in a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands and would result in a moderate impact to those wetlands.

| TABLE I-3.2-2<br>Forested and Scrub-Shrub Wetlands Crossed<br>by the Proposed Project in Montana | | | | |
|---|---|---|---|---|
| **County** | **Milepost** | **Associated River or Stream** | **Wetland Classification[1,2]** | **Reported Vegetation** |
| Phillips | 25.63 | Unnamed | PFO | Not available[3] |
| Phillips | 25.66 | Unnamed | PFO | Not available |
| Valley | 25.87 | Frenchman Creek | PSS | Willows |
| Valley | 25.92 | Frenchman Creek | PSS | Willows |
| Valley | 36.16 | Unnamed (Intermittent) | PFO | Not available |
| Valley | 36.18 | Unnamed (Intermittent) | PFO | Not available |
| Valley | 40.97 | Unnamed | PFO | Not available |
| Valley | 55.24 | Buggy Creek | PFO | Young cottonwoods |
| Valley | 55.29 | Buggy Creek | PFO | Young cottonwoods |
| Valley | 66.85 | Cherry Creek | PFO | Mature trees |
| Valley | 66.89 | Cherry Creek | PFO | Mature trees |
| Valley | 66.95 | Cherry Creek | PFO | Mature trees |
| Valley | 66.96 | Cherry Creek | PFO | Mature trees |
| Valley | 67.02 | Cherry Creek | PFO | Mature trees |
| Valley | 67.07 | Cherry Creek | PFO | Mature trees |
| Valley | 82.12 | Unnamed | PSS | Not available |
| Valley | 82.18 | Unnamed | PSS | Not available |
| Valley | 82.45 | Unnamed | PSS | Not available |
| Valley | 82.56 | Unnamed | PFO | Not available |
| Valley | 82.70 | Milk River | PFO | Mature cottonwoods |
| McCone | 89.73 | Missouri River | PFO | Trees and shrubs |
| McCone | 122.16 | Unnamed | PFO | Not available |
| Dawson | 158.83 | Cottonwood Creek | PFO | Not available |
| Dawson | 158.90 | Cottonwood Creek | PFO | Not available |
| Dawson | 159.57 | Unnamed (Intermittent) | PFO | Not available |
| Dawson | 159.60 | Unnamed (Intermittent) | PFO | Not available |
| Dawson | 177.19 | Unnamed (Intermittent) | PFO | Not available |
| Dawson | 177.22 | Unnamed (Intermittent) | PFO | Not available |
| Dawson | 195.64 | Yellowstone River | PFO | Mature cottonwoods |
| Fallon | 221.87 | Unnamed | PFO | Not available |
| Fallon | 231.04 | Unnamed (Intermittent) | PSS | Not available |
| Fallon | 261.06 | Unnamed | PSS | Not available |

Sources: ENTRIX 2009, Keystone 2009a.

[1] PFO = Palustrine forested wetland; PSS = Palustrine scrub-shrub wetland.

[2].For the purposes of this analysis, riparian forests 300 feet by 30 feet or larger were classified as forested wetlands.

[3] Information on vegetation was not reported in the sources used to prepare this table.

In an assessment of modeled heat flux, Keystone determined that operation of the proposed Project would result in an increase of 5 to 8 ˚F in soil temperature at the soil surface above the pipeline in Montana from November to May (Keystone 2009b). At a depth of 6 inches below the ground surface, the modeled heat flux evaluation indicated that operation of the proposed Project would cause increases in soil temperature over the pipeline of 5 to 12 ˚F, with the largest increases occurring during March and April in Montana. While many herbaceous annual plants do not produce root systems that would penetrate much below 6 inches, some plants – notably native prairie grasses, trees, and shrubs – have root systems penetrating well below 6 inches. Keystone also found that, in general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity for wetland plant species (Keystone 2009b).

Operation of the proposed Project also would cause slight increases in water temperatures where the pipeline crossed through wetlands. The effects would be most pronounced in small ponds and wetlands since any excess heat would be quickly dissipated in large waterbodies and flowing waters. Small ponded wetlands over the pipeline might remain unfrozen a few days later than surrounding wetlands and might thaw a few days sooner than surrounding wetlands. The seasonal increase in temperatures over the pipeline would last for the life of the proposed Project but would result in a minor impact to wetlands along the proposed route.

### I-3.2.3 REFERENCES CITED


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## I-3.3 TERRESTRIAL VEGETATION

Section 3.5 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on terrestrial vegetation, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

### I-3.3.1 AFFECTED ENVIRONMENT

Land cover across the proposed Project in Montana is dominated by native range and agricultural lands (Table I-3.3-1). Terrestrial vegetation occurring along the proposed route in Montana, as determined from data sources different from those used in this appendix, is also described in Section 3.5.2 of the EIS.

**TABLE I-3.3-1**
**Land Cover Types Crossed by the Proposed Pipeline Route in Montana**

| Cover Type | Length Through Cover Type (miles) | Area in Construction ROW (acres)[1] | Percent of Total Area in Construction ROW[1] |
|---|---|---|---|
| Open water | 0.3 | 4.0 | 0.1 |
| Developed land (e.g., road, buildings, cleared areas) | 3.3 | 44.0 | 1.2 |
| Wetlands | 0.2 | 2.7 | 0.1 |
| Riparian | 7.5 | 100.0 | 2.6 |
| Greasewood flats | 1.0 | 13.3 | 0.3 |
| Agricultural (crop and hay lands) | 74.8 | 997.3 | 26.5 |
| Badlands | 14.5 | 193.3 | 5.1 |
| Conifer forest | 1.8 | 24.0 | 0.6 |
| Wooded draws | 1.9 | 25.3 | 0.7 |
| Sagebrush steppe | 32.1 | 428.0 | 11.4 |
| Native range (mixed-grass prairie) | 145.1 | 1,934.7 | 51.4 |
| **Total** | **282.5** | **3,766.6** | **100.0** |

Source: Montana Natural Heritage Program (MNHP) 2009a database was used for identification of established land categories along the proposed route; some lengths listed in this table differ from the more specific information obtained by Keystone during route surveys and provided elsewhere in this appendix

[1] Acreage is based on a construction ROW width of 110 feet.

Native rangeland vegetation communities primarily consist of mixed-grass prairie dominated by blue grama (*Bouteloua gracilis*)[5], green needlegrass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*), and western wheatgrass (*Pascopyrum smithii*); sagebrush communities dominated by silver sagebrush (*Artemisia cana*), big sagebrush (*Artemisia tridentata*), and rubber rabbitbrush (*Ericameria nauseosus*); and greasewood (*Sarcobatus vermiculatus*) or Nuttall's saltbush (*Atriplex nuttallii*) in the alkali flats.

[5] Common names of plants are used in this section. Scientific names for plants are used after their initial mention in text or tables following nomenclature in the U.S. Department of Agriculture, Natural Resources Conservation Service's PLANTS database (USDA NRCS 2009)

Mixed-grass prairies have floristic components of tall-grass and short-grass prairies and are characterized by grasses of the short-grass prairie (e.g., blue grama) and some grasses of the tall-grass prairie including wheatgrasses (*Elymus* spp., and *Pascopyrum smithii*)) and bluestem species (*Andropogon gerardii* and *Schizachyrium scoparium*). The primary upland shrub communities that occur throughout the proposed Project area are big sagebrush on dry uplands having heavier soils and silver sagebrush on sites having greater levels of soil moisture. Sagebrush shrub communities are susceptible to fire and might have a natural fire return interval of 100 to 200 years, depending on topography and exposure, while sagebrush communities on more mesic sites might have a natural fire interval of decades (USFWS 2008). Post-fire reestablishment of sagebrush communities might require 20 to 50 years.

Most of the forests in eastern Montana occur along streams and rivers, in rugged topography (breaks) or where rolling hills are dissected by drainages. Riparian communities along many perennial streams are dominated by an overstory of green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), and plains cottonwood. Upland forest communities include isolated, small patches of quaking aspen (*Populus tremuloides*) on cool, moist microsites (mostly confined to the Bitter Creek area in north-central Montana), and Rocky Mountain juniper (*Juniperus scopulorum*) and ponderosa pine (*Pinus ponderosa*) on breaks and on areas with shallow sandstone bedrock. Native forest communities are an integral component of the prairie landscape throughout Montana and the Great Plains and provide important breeding, feeding, and security habitat for many types of wildlife. Native forest communities also support a distinct assemblage of plant species not found on upland sites and are important sources of plants of ethnobotanical importance (cultural and spiritual) to Indian tribes.

Indian tribes have traditionally used many plants for food, construction materials, forage for livestock, fuel, medicine, and spiritual purposes (Johnston 1987, Hart and Moore 1976, Gilmore 1977). Although the dependence on plants for many aspects of survival in the natural environment has become less pronounced in recent times, plants continue to be of substantial importance to the culture of most Indian tribes. The plants are important and in some cases are sacred to indigenous peoples. However, it is not only the plants that possess spiritual qualities, places where important plants grow and have been collected for millennia can have spiritual and cultural significance.

Plants of ethnobotanical importance known or likely to occur in the proposed Project area include species from all native vegetation communities (Table I-3.3-2). A large proportion of the plants used by Native Americans grow in wetlands and riparian areas. Although these habitats are a small percentage of the land area, they are disproportionately important as sources for plants of ethnobotanical importance. In addition to plants that are used by the Indian tribes in the vicinity of the proposed route, plants such as prairie coneflower are widely used by the non-Indian population as herbal supplements and collected for sale outside of the general area of the proposed Project. Locally, collection and sale of echinacea is an important source of income for residents of the Fort Peck Reservation. Although the proposed route would not directly affect Reservation lands, residents of the Fort Peck Reservation collect plants of ethnobotanical importance outside of the Reservation on land that might include land within the construction ROW.

**TABLE I-3.3-2**
**Plants of Ethnobotanical Importance in the Vicinity of the Proposed Pipeline Route in Montana[1]**

| English Common Name (Scientific Name) | Habitat | Use |
|---|---|---|
| Northern sweetgrass (*Hierochloe hirta*) | Moist meadows and margins of wetlands | Incense, perfume, smoked with tobacco |
| Cattail (*Typha latifolia/angustifolia*) | Emergent in wetlands | Down used to dress wounds; starchy roots eaten |
| Field (wild) mint (*Mentha arvensis*) | Wetlands | Used as a flavoring and tea; dried leaves used to treat chest pains |
| Cow parsnip (*Heracleum maximum*) | Riparian areas and wooded draws | Stems eaten; used in Sun Dance ceremony |
| Stinging nettle (*Urtica dioica*) | Riparian areas and margins of wetlands | Decoction made from root; fibers used as cordage |
| Horsetail (*Equisetum arvense/hyemale*) | Moist meadows and margins of wetlands | Used for polishing; children's whistles |
| Seaside arrow-grass (*Triglochin maritima*) | Saline wetlands | Seeds parched and eaten |
| Arumleaf arrowhead (*Sagittaria cuneata*) | Emergent in perennial wetlands | Roots eaten |
| Baltic rush (*Juncus arcticus)*) | Wet meadows and wetlands | Used to make a brown dye |
| Plains cottonwood (*Populus deltoides*) | Riparian area along major rivers and streams | Used as center post for Sun Dance Medicine Lodge; firewood; inner bark eaten |
| Chokecherry (*Prunus virginiana*) | Riparian areas and wooded draws | Fruit eaten |
| Silver buffaloberry (*Shepherdia argentea*) | Riparian areas and wooded draws | Fruit eaten; used to make red dye |
| Golden currant (*Ribes aureum*) | Riparian areas and wooded draws | Fruit eaten |
| Red baneberry (*Actaea rubra*) | Riparian areas and wooded draws | Roots used as remedy for colds and for women after child birth |
| Hawthorn (*Crataegus* spp) | Riparian areas and wooded draws | Fruit eaten and wood used for objects requiring hard wood |
| Willow (*Salix* spp.) | Riparian areas | Twigs boiled as decoction to cure fever or as a pain killer |
| Red-osier dogwood (*Cornus sericea*) | Riparian areas and wetlands | Inner bark smoked with tobacco and used to make tea |
| Silverberry (*Elaeagnus commutata)* | Moist uplands | Fruits used as famine food; seeds used as beads |
| Western water hemlock (*Cicuta douglasii*) | Wetlands | Used as medicine to induce vomiting and as a treatment for sores |
| Juniper (*Juniperus* spp.) | Uplands in prairie grasslands | Berries steeped in water to make medicine for various ailments |
| Blue grama (*Bouteloua gracilis*) | Dry native prairie | Used to forecast weather |
| Wild onion (*Allium* spp.) | Prairie grasslands | Bulbs and leaves eaten |
| Indian ricegrass (*Achnatherum hymenoides*) | Prairie grasslands | Large seeds eaten |
| Sedges (*Carex* spp.) | Prairie grasslands and wetlands | Used to line moccasins in winter |
| Yellow bell (*Fritillaria pudica*) | Prairie grasslands | Bulbs eaten |
| Sego lily (*Calochortus nuttallii*) | Prairie grasslands | Bulbs eaten |

| TABLE I-3.3-2<br>Plants of Ethnobotanical Importance in the Vicinity of the Proposed Pipeline Route in Montana[1] | | |
|---|---|---|
| **English Common Name (Scientific Name)** | **Habitat** | **Use** |
| Wild rose (*Rosa* spp.) | Prairie grasslands, riparian areas and wooded draws | Fruits eaten |
| Saskatoon (*Amelanchier alnifolia*) | Riparian areas and wooded draws | Fruits eaten |
| Winterfat (*Krascheninnikovia lanata*) | Prairie grasslands | Leaves used to make tea and as hair rinse |
| Spring beauty (*Claytonia* spp.) | Prairie grasslands and shrublands | Corms eaten |
| Prairie sagewort (*Artemisia frigida*) | Prairie grasslands and shrublands | Leaves boiled and used for various ailments |
| White sage (*Artemisia ludoviciana*) | Prairie grasslands and shrublands | Leaves used as incense in purification ceremonies |
| Shrubby cinquefoil (*Dasiphora fruticosa*) | Shrublands | Dry flakey bark used as tinder |
| Wild licorice (*Glycyrrhiza lepidota*) | Riparian areas and edges of moist meadows | Decoction from roots used for various ailments |
| Pasque flower (*Pulsatilla patens*) | Prairie grasslands | Crushed leaves used as poultice |
| Wild strawberry (*Fragaria virginiana*) | Grasslands | Fruits eaten; roots used as a medicine for diarrhea |
| Large Indian breadroot (*Pediomelum esculenta*) | Prairie grasslands | Tubers eaten and made into flour |
| Prairie clover (*Dalea* spp.) | Prairie grasslands and shrublands | Bruised leaves steeped in water and applied to wounds |
| Prairie coneflower (*Echinacea angustifolia*) | Prairie grasslands and shrublands | Roots of plants used to treat tooth aches |
| Narrowleaf stoneseed (*Lithospermum incisum*) | Prairie grasslands and shrublands | Seeds and tops used as incense; root used to make violet dye |
| Scarlet globemallow (*Sphaeralcea coccinea*) | Prairie grasslands and shrublands | Plant chewed and applied to cuts and sores |
| Plains prickly pear cactus (*Opuntia polyacantha*) | Prairie grasslands and shrublands | Fruit and stems eaten; juice applied to sores |

Sources: Johnston 1987, Hart and Moore 1976, Gilmore 1977.
[1] Table does not list all plants used by Indian tribes in the vicinity of the proposed Project.

Riparian areas are transitional between wetland and upland habitats, generally lacking the amount or duration of water present in wetlands. Riparian habitats in the vicinity of the proposed route identified as conservation priorities include wooded draws, dominated by green ash, and broadleaf riparian, dominated by plains cottonwood (MFWP 2005). The proposed route crosses significant Montana riparian habitats near the confluence of the Milk and Missouri rivers, and near the Yellowstone River. Wooded draws are present in central and southeastern Montana along the proposed route.

Noxious weeds and invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. Montana has experienced the rapid introduction and spread of noxious weeds and invasive plants on all types of land ownership. Ground disturbing activities such as agriculture, construction, and development of transportation corridors increase the spread of weeds due to transport by heavy machinery and vehicles during construction or through post-construction revegetation using contaminated seed sources. Up to 32 noxious weed species could occur within the construction ROW in Montana, including four aquatic or wetland weeds, 22 upland weeds, and six weeds that can occur in either wetland or upland habitats

(USDA NRCS 2009). Table 3.5.4-1 in the main body of the EIS lists the noxious weed species along the proposed route, including species in Montana.

Fourteen plants tracked by the Montana Natural Heritage Program as Species of Special Concern, six of which are also managed as Sensitive Species by the BLM, might be present in the vicinity of the proposed route in Montana (Table I-3.3-3). Surveys for special-status plants along the construction ROW have not been completed; however, the proposed route would cross suitable habitats and known ranges for these plants.

**TABLE I-3.3-3**
**Plants of Special Concern Potentially Present in the Vicinity of the Proposed Pipeline Route in Montana**

| Common Name and Species | Occurrence and Conservation Status[1] | Habitat |
|---|---|---|
| Raceme milkvetch (*Astragalus racemosus*) | Fallon and Carter counties; S2 | Sagebrush and grassland communities on heavy soils derived from shale with high levels of alkalinity |
| Poison suckleya (*Suckleya suckleyana*) | Known from one extant population in Dawson County and three historic collections; S1 | Drying mud along ponds and streams, often on alkali soils |
| Crawe's sedge (*Carex crawei*) | BLM sensitive. One occurrence near the proposed Project area; S2 | Wet gravelly or sandy soils along streams and ponds |
| Nine-anther dalea (*Dalea enneandra*) | Five occurrences in eastern Montana; S1 | Gravelly soils of grasslands and slopes |
| Showy prairie gentian (*Eustoma exaltatum*) | One occurrence in Montana in McCone County; S1 | Wet meadows and pond margins |
| Bractless blazing star (*Mentzelia nuda*) | BLM sensitive. At the periphery of range in Montana; S1 | Sandy or gravelly soils on open hills and roadsides |
| Chaffweed (*Anagallis minima*) | BLM sensitive. Three occurrences in eastern Montana: S2 | Vernally wet, sparsely vegetated soils along ponds and stream margins |
| Texas toadflax (*Nuttallanthus texanus*) | Known from occurrence near Glendive and Alzada; S1 | Open sandy or acidic soil of grasslands and woodlands |
| Broadbeard beardtongue (*Penstemon angustifolius*) | BLM sensitive. At the periphery of range in Montana; S1S2 | Sandy soils of prairie grasslands, often most abundant in blowouts |
| Hotspring phacelia (*Phacelia thermalis*) | Known from a small number of sites in northeastern Montana; disjunct from its primary range in Idaho and California; S1 | Variable habitat, often on disturbed sites |
| Prairie phlox (*Phlox andicola*) | BLM sensitive. At periphery of range in Montana; S2 | Sandy soils in grasslands and ponderosa pine woodlands, often associated with sparsely vegetated blowouts |
| Sand cherry (*Prunus pumila*) | Known from two collections in Fallon and McCone counties; S1 | Sandy and rocky soils in prairie grasslands |
| Persistent-sepal yellowcress (*Rorippa calycina*) | BLM sensitive, regional endemic, known from four records in Montana; S1 | Moist sandy to muddy margins of streams, ponds, and reservoirs near the high-water line |
| American bittersweet (*Celastrus scandens*) | Known from one site in Dawson County, at periphery of range in Montana; S1 | Riparian woodlands and thickets |

Sources: MNHP 2009b, BLM 2009.

[1] MNHP State Rankings
S1 = State critically imperiled
S2 = State imperiled
S1S2 = State status uncertain, critically imperiled to imperiled

### I-3.3.2 POTENTIAL IMPACTS AND MITIGATION

Most of the land that would be crossed by the proposed route in Montana would be native range and land managed for agriculture (e.g., cropland, non-native pasture, and hay land). Approximately 21 percent of the length of the proposed route would cross other land cover categories (see Table I-3.3-1). Potential construction- and operations-related impacts and mitigation methods for terrestrial vegetation along the entire proposed route are discussed in Section 3.5.5 of the EIS.

The primary impacts on vegetation from construction and operation of the proposed Project in Montana would result from cutting, clearing, or removing the existing vegetation within the construction ROW. In addition, those activities would increase the potential for invasion by noxious weeds in the construction ROW. Impacts on croplands would likely be short term and limited to the then-current growing season. However, Keystone would compensate landowners or tenants for the loss of crops. Impacts on pastures, rotated croplands, and native rangeland generally would range from short term to long term, with vegetation typically becoming reestablished within one to five years after construction. However, re-established vegetation could differ from adjacent native plant communities in diversity, canopy structure, and productivity. The rate of development of reestablished plant communities (i.e., ecological succession) would be influenced by localized factors such as climatic conditions, levels of grazing and trampling, seed mixes, and soil amendments. The impacts to these vegetation communities would range from short term to long term and would be of minor to moderate magnitude.

Clearing trees within upland and riparian forest communities would result in long-term impacts to these vegetation communities because of the length of time needed for the communities to mature to pre-construction conditions. Forest and shrub communities within the 10-foot-wide riparian and the 30-foot-wide upland permanent ROW centered on the pipeline would experience impacts for the life of the proposed Project, as would areas where trees would be removed and prevented from reestablishing as a result of the periodic mowing and brush clearing required for pipeline operation and inspections. Routine maintenance involving vegetation clearing would occur every one to three years.

Most shrubs would likely reestablish within the non-maintained portion of the ROW within five to 15 years. However, longer periods might be required for the development of pre-construction levels of biodiversity and productivity. The native-species composition of post-construction plant communities might not develop to pre-construction levels for 30 to 50 years or longer. Shrubs and warm-season grasses are slow to colonize on sites that have developed vigorous stands of cool-season wheatgrasses and other species typically used in reclamation seed mixes. Seed mixes for reclamation are primarily developed to rapidly establish ground cover to minimize erosion and the invasion of noxious weeds. The dominance of rapidly germinating and vigorous grasses is effective in stabilizing soils but can also inhibit the development of plant communities with diversities of native forbs, shrubs, and warm-season grasses comparable to undisturbed native prairie communities. These impacts would range from long term to permanent (i.e., lasting for at least the life of the proposed Project) and would be of minor to moderate magnitude. However, during operation the effect on plant communities established along the ROW after the completion of construction would be minimal because these areas would be allowed to recover following construction and typically would not require maintenance mowing.

In an assessment of temperature increases of soil surrounding the pipeline, Keystone determined that operation of the proposed Project would cause an increase of 5 to 8 ˚F in soil temperatures at the soil surface over the pipeline in Montana, from November to May (Keystone 2009). At a depth of 6 inches below the ground surface, the study indicated that operation of the proposed Project would cause increases of 5 to 12 ˚F in soil temperature over the pipeline, with the greatest increases occurring during March and April in Montana. While many herbaceous annual plants would not produce root systems that would penetrate much below 6 inches, some plants, notably native prairie grasses, trees, and shrubs, have root systems that would penetrate well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet might be as much as 40 ˚F warmer than the ambient surrounding soil temperatures (Keystone 2009). Keystone also found that, in general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in annual crops, and that in some cases increased soil temperatures could lead to increased soil drying and decreased plant-available soil water. However, this effect has not been documented to occur with similar pipelines (Keystone 2009).

After removal of vegetation cover and disturbance to the soil, re-establishment of native vegetation communities could be delayed or prevented by infestations of noxious weeds and invasive plants. A total of 47 noxious weed sources have been identified along the proposed route in Montana. Approximately 4.6 miles of the proposed route would extend through those sources (Table I-3.3-4). Section 3.5.4 of the EIS addresses noxious weeds, including potential impacts and the procedures that Keystone would incorporate into the proposed Project to minimize the spread of noxious weeds. As described in that section of the EIS, Keystone has committed to control the introduction and spread of noxious weeds by implementing the construction and restoration procedures detailed in its CMR Plan (Appendix B to the EIS). Keystone would also incorporate the MDEQ Environmental Specifications (Attachment 1 to this appendix) into the proposed Project.

**TABLE I-3.3-4**
**Noxious Weed Sources Occurring Along the Proposed Pipeline Route in Montana**

| Number of Counties | Weed Type | Length of Pipeline Through the Sources (miles) | Number of Sources Crossed |
|---|---|---|---|
| Four of six | Bindweeds (*Convolvulus* spp.) | 0.98 | 5 |
| One of six | Common tansy (*Tanacetum vulgare*) | 0.09 | 1 |
| One of six | Hawkweeds (*Hieracium* spp.) | 0.01 | 1 |
| Three of six | Knapweeds (*Centaurea* spp.) | 1.24 | 21 |
| Two of six | Leafy spurge (*Euphorbia esula*) | 2.02 | 13 |
| Two of six | Plumeless Thistles (*Carduus* spp.) | 0.20 | 5 |
| One of six | Thistles – Canada and Bull (*Cirsium* spp.) | 0.01 | 1 |
| **Total** | | **4.55** | **47** |

Source: Keystone 2009.

Sensitive plants potentially affected by construction through native vegetation communities would include raceme milkvetch, prairie clover, bractless blazing star, Texas toadflax, broadbeard beardtongue, prairie phlox, and sand cherry. Sensitive plants potentially affected by construction through wetlands and riparian communities would include poison suckleya, Crawe’s sedge, showy prairie gentian, chaffweed, persistent-sepal yellowcress, and American bittersweet. Based on the availability of potential suitable habitats, known population distributions, and the protective measures in the Keystone CMR Plan that would be incorporated into the proposed Project, construction of the proposed Project would result in some reduction of available suitable habitat for sensitive plants and could result in the loss of some individual plants. However, the viability of the plants over their range would not be adversely affected. As a result, the impact to sensitive species would be long term but minor.

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## I-3.4 WILDLIFE

Section 3.6 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on wildlife, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

### I-3.4.1 AFFECTED ENVIRONMENT

There is a diversity of wildlife habitat in the vicinity of the proposed Project in eastern Montana. The combination of native prairie, sagebrush steppe, riparian forest, and wetlands supports a high diversity of wildlife including mule deer[6] (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), pronghorn (*Antilocapra americana*), coyote (*Canis latrans*), swift fox (*Vulpes velox*), striped skunk (*Mephitis mephitis*), American badger (*Taxidea taxus*), black-tailed prairie dog (*Cynomys ludovicianus*), North American porcupine (*Erethizon dorsatum*), ground squirrels (*Spermophilus* spp.), greater sage-grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus jamesi*), gray partridge (*Perdix perdix*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), burrowing owl, mourning dove (*Zenaida macroura*), long-billed curlew (*Numenius americanus*), upland sandpiper (*Bartramia longicauda*), Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit (*Anthus spragueii*), horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), and other passerines typically found on rangelands and croplands (also see Sections 3.6 and 3.8 of the EIS.).

Grassland and sagebrush communities in the vicinity of the proposed Project provide habitat for sharp-tailed grouse and greater sage-grouse and contain strutting grounds (leks) and nesting habitat. Native prairie grasslands are sought exclusively for breeding by Baird's sparrow, burrowing owl, clay-colored sparrow (*Spizella pallida*), long-billed curlew, Sprague's pipit, and upland sandpiper. Many of the remaining native grasslands have been reduced and fragmented and are present as discontinuous blocks surrounded by cultivated fields. Because of the loss of native prairie and sagebrush communities in the United States and Canada, resource agencies and conservation groups are concerned about the viability of species that are obligate users of these habitats.

The vegetation on large portions of land in the vicinity of the proposed route in Montana has been converted from native plants to agricultural fields, primarily on floodplains and upland benches. Most farmland is planted in small grains or is in the Conservation Reserve Program (CRP). Wildlife species associated with farmland and adjacent native habitats include American goldfinch (*Spinus tristis*), brown-headed cowbird (*Molothrus ater*), gray partridge, ring-necked pheasant (*Phasianus colchicus*), sharp-tailed grouse, mule deer, white-tailed deer, and red fox (*Vulpes vulpes*).

Northern harriers (*Circus cyaneus*), red-tailed hawks, and American kestrels (*Falco sparverius*) are the most common raptors in the vicinity of the proposed route. Northern harriers prefer to nest in marshy areas near water but forage in all habitats. Typically, Swainson's and red-tailed hawks nest in trees, and prairie falcons and peregrine falcons nest on cliffs. Ferruginous hawks nest in trees, shrubs, and on rocky outcrops. Potential Swainson's and red-tailed hawk nesting sites occur in cottonwood trees along drainages, in woody draws, and shelterbelts. There are few cliffs suitable for peregrine and prairie falcon nests in the vicinity of the proposed route. Rough-legged hawks (*Buteo lagopus*) are common winter

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[6] For animals discussed in this section, common names are used in the text with the scientific name as per nomenclature of the NatureServe Explorer database (NatureServe 2009) provided after the first reference of the common name.

residents in the area, migrating from arctic and sub-arctic regions of North America. Gyrfalcons (*F. rusticolus*) and snowy owls (*Bubo scandiacus*) are also periodic winter visitors, particularly during severe winters in northern Canada.

Wetlands are present along perennial and ephemeral drainages, in association with reservoirs and stock ponds, and in poorly drained depressions. Wildlife commonly associated with wetlands include black-crowned night heron (*Nycticorax nycticorax*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), boreal chorus frog (*Pseudacris maculata*), and northern leopard frog (*Rana pipiens*). The Missouri and Yellowstone rivers provide habitat for American white pelican (*Pelecanus erythrorhyncus*), least tern (*Sternula antillarum*), piping plover (*Charadrius melodus*), North American beaver (*Castor canadensis*), American mink (*Neovison vison*), common muskrat (*Ondatra zibethicus*), northern painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentine*), and spiny softshell (*Apalone spinifera*).

Other amphibians and reptiles present in the vicinity of the proposed route use a variety of habitats and include Great Plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousii*), plains spadefoot (*Spea bombifrons*), tiger salamander (*Ambystoma tigrinum*), garter snakes (*Thamnophis* spp.), gopher snake (*Pituophis catenifer*), eastern racer (*Coluber constrictor*), western hog-nosed snake (*Heterodon nasicus*), western (prairie) rattlesnake (*Crotalus viridis*), greater short-horned lizard (*Phrynosoma hernandesi*), and common sagebrush lizard (*Sceloporus graciosus*).

The following sections address the existing conditions for prairie grouse (Section I-3.4.1.1) and special-status wildlife (Section I-3.4.1.2) in Montana.

### I-3.4.1.1 Prairie Grouse

Prairie grouse in Montana include the greater sage-grouse and sharp-tailed grouse. Both of these grouse congregate at strutting grounds or "leks," where males perform courtship displays and where breeding occurs. Prairie grouse exhibit a high degree of fidelity to lek locations and return to the same location each spring, although leks might shift in location over time. Disturbances at or near leks can disrupt breeding activities and limit reproductive success. Important habitats for both of these grouse, including habitats for lek sites, occur in and near the proposed construction ROW in Montana.

#### Greater Sage-Grouse

The greater sage-grouse is a game species in Montana. It is designated as a sensitive species by the BLM and is a species of concern in Montana. Greater sage-grouse is of conservation concern because of long-term population declines from the loss and degradation of sagebrush habitat (Knick and Connelly 2009, Schroeder et al. 2004). Several petitions have occurred to have the greater sage-grouse considered for federal listing as a threatened or endangered species. In April 2004, the USFWS determined that listing the greater sage-grouse under the Endangered Species Act (ESA) might be warranted and initiated a status review. The 12-month finding of the status review determined that listing was not warranted (70 FR 2244). However, this determination was ruled arbitrary and capricious by the U.S. District Court of Idaho. The USFWS initiated a status review to reevaluate this finding, and on March 5, 2010 announced that listing the greater sage-grouse (rangewide) was warranted, but precluded by higher priority listing actions (USFWS 2010; 75 FR 55, March 23, 2010).

Sage-grouse are sagebrush-obligate birds that prefer sagebrush stands with a canopy cover of at least 20 percent and a height of 8 inches or higher. Research conducted in Montana found that breeding habitat usually occurred in sagebrush habitat with 20 to 50 percent sagebrush canopy cover (Montana Sage Grouse Work Group [MSGWG] 2005). Optimum sagebrush densities for sage-grouse are more than 4,000 plants per hectare (Pyke 2009). Leks are typically located in areas of bare ground or low-density vegetation such as ridge tops. Nesting typically occurs within 2 to 4 miles of the lek and in areas with a sagebrush canopy cover of between 15 to 30 percent. Although sagebrush habitat is crucial for all seasons and life stages, wet meadows and riparian areas are critical for the brood-rearing. Wet meadows and riparian habitats provide a diversity of insects for chicks to feed on and a variety of forbs for juveniles and hens. Sage-grouse winter in tall and large expanses of dense sagebrush with an average canopy cover of 20 percent and a height of 10 inches (MSGWG 2005). The proposed route passes through mapped sage-grouse habitat (MFWP 2001a).

### Sharp-Tailed Grouse

The plains variety of sharp-tailed grouse is a game species in Montana, with no special conservation status. Sharp-tailed grouse are primarily a grassland species and their preferred habitats are grasslands and mixed-shrubs (Connelly et al. 1998, Montana Natural Heritage Program [MNHP] 2009a). Sharp-tailed grouse numbers have declined across much of the Great Plains and intermountain west due to habitat loss (Connelly et al. 1998). Populations in Montana have been more secure than in other areas of their range (Connelly et al. 1998). Many populations depend on cropland to varying degrees. Leks are often located on elevated areas with less vegetation than surrounding areas. Structural diversity of habitat (grasses, forbs, and shrubs) provides high-quality nesting habitat, although sharp-tailed grouse might nest in cultivated hayfields (grass and alfalfa) and wheat stubble. Nests are often located within 2 miles of leks (Connelly et al. 1998). The diet of the sharp-tailed grouse includes a variety of forbs, fruits, grains, buds, and insects. In winter, sharp-tailed grouse use riparian areas, deciduous hardwood shrub draws, and deciduous and open coniferous woods. Potential sharp-tailed grouse habitat (mixed-grass prairie, riparian, conifer forest, and crop and hay lands) occurs along most of the proposed route (MFWP 2001b).

### Lek Surveys

Aerial lek surveys of the proposed Project route that were completed by Keystone (2009) found no new sage-grouse or sharp-tailed grouse leks within 0.6 mile of the proposed centerline in Montana or within 2 miles of proposed pump station locations; however, those surveys were not comprehensive. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the proposed route in Montana). Data from that survey indicated that 36 sage-grouse leks and 36 sharp-tailed grouse leks were active within 4 miles of the proposed route (Table I-3.4-1). The Keystone survey along that part of the proposed route did not document activity at several of the known active leks near the route. In addition, it is likely that additional sage-grouse and sharp-tailed grouse leks are present within areas not surveyed by MFWP in the vicinity of the proposed route (P. Gunderson, pers. comm. 2009; W. Davis, pers. comm. 2009).

**TABLE I-3.4-1**
**Prairie Grouse Lek Sites Observed During Surveys in the Vicinity of the Proposed Project Route in Montana**

| | Leks Within Specified Distances of ROW Centerline | | | |
|---|---|---|---|---|
| **Species** | **1 mile** | **2 miles** | **3 miles** | **4 miles** |
| Greater sage-grouse | 5 | 11 | 24 | 36 |
| Sharp-tailed grouse | 8 | 19 | 29 | 36 |

Sources: MFWP 2009a, 2009b, 2009c.

### I-3.4.1.2 Special-Status Wildlife

Special-status wildlife are animals listed as threatened, endangered, or candidate species under the ESA of 1973; species managed as "sensitive" by the BLM; and species of special concern tracked by the Montana Natural Heritage Program. Animals of special concern are considered by the Montana Natural Heritage Program to be vulnerable to extirpation across their range or across the state due to rarity, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances. Special-status wildlife species that are potentially present in the vicinity of the proposed Project in Montana include four federally protected species and 67 species listed as conservation concerns by BLM and Montana (15 mammals, 42 birds, seven reptiles, and three amphibians). Federally protected and BLM sensitive species are addressed in the main body of the EIS in Section 3.8. Montana wildlife of concern that are not federally listed or designated BLM sensitive species and are analyzed in this section and listed in Table I-3.4-2. Because of the large number of Montana species of concern, the descriptions presented below are aggregated into the following groups based on habitats used: grassland birds, wetland and water birds, forest birds, bats, shrews, and reptiles. The greater sage-grouse is a conservation concern for BLM and Montana, but for the purposes of this discussion that species is presented with the sharp-tailed grouse in the prairie grouse section above.

**TABLE I-3.4-2**
**Special-Status Wildlife Potentially Occurring in the Vicinity of the Proposed Project in Montana**

| Common and Scientific Names | Distribution and State Rank[1] | Habitat Associations |
|---|---|---|
| **Mammals of Conservation Concern** | | |
| Arctic shrew (*Sorex arcticus*) | Known only from extreme northeast Montana (Sheridan County), alternate routes could include occupied habitat; S1S3. | Primarily found in moist sites, such as wet meadows, swamps, and marshes; also, sandy flats of floodplains. |
| Dwarf shrew (*Sorex nanus*) | Predicted distributions include eastern Montana, south of the Missouri River; S2S3 | A variety of habitats from short-grass prairie and sagebrush to alpine tundra. |
| Eastern red bat (*Lasiurus borealis*) | The distribution in Montana is not well documented, expected to occur across eastern Montana; S2S3 | Wooded riparian areas, solitary and roosts in tree foliage |
| Hoary bat (*Lasiurus cinereus*) | Potentially present throughout the proposed Project area; S3 | Forested areas |
| Merriam's shrew (*Sorex merriami*) | Predicted distribution includes portions of eastern Montana, south of the Missouri River ;S2 | Arid sagebrush-grassland habitats |
| Preble's shrew (*Sorex preblei*) | Known to occur in Valley and Dawson counties and elsewhere in western and central Montana; S3 | Arid to semi-arid grassland and sagebrush habitats from plains to subalpine zones. |
| **Birds of Conservation Concern** | | |
| American bittern (*Botaurus lentiginosus*) | Not likely breeding in proposed Project area; S3B | Freshwater wetlands with tall emergent vegetation and perennial water |
| American white pelican (*Pelecanus erythrorhyncus*) | It is unlikely that the proposed Project would affect nesting or foraging habitat; S3B | Colonial nester on islands of lakes and reservoirs; forages over large areas in rivers, lakes, and ponds. |
| Black-billed cuckoo (Coccyzus erythropthalmus) | Potentially present in riparian habitats in proposed Project area; S3B. | Species prefers thick, forested areas, usually near water. |

**TABLE I-3.4-2**
**Special-Status Wildlife Potentially Occurring in the Vicinity of the Proposed Project in Montana**

| Common and Scientific Names | Distribution and State Rank[1] | Habitat Associations |
|---|---|---|
| Black-crowned night heron (*Nycticorax nycticorax*) | Breeding not documented in the proposed Project area; S3B | Shallow marshes with cattail and bulrush, often in grassland matrix |
| Black-necked stilt (*Himantopus mexicanus*) | Breeding is documented in Phillips County and is transient in the proposed Project area; S3B | Nest in medium to large wetland complexes consisting of open marsh and meadows, including alkali areas. |
| Bobolink (*Dolichonyx oryzivorus*) | Breeding documented for counties in proposed Project area; S2B | Meadows with dense grass cover |
| Caspian tern (*Hydroprogne caspia*) | It is unlikely that the proposed Project would affect nesting habitat; S2B | Islands in large lakes or reservoirs with rocky or sandy shores for nesting |
| Common tern (*Sterna hirundo*) | It is unlikely that the proposed Project would affect nesting habitat; S3B | Nests on sparsely vegetated islands in large lakes and reservoirs |
| Forster's tern (*Sterna forsteri*) | It is unlikely that the proposed Project would affect nesting habitat; S3B | Large marshes with extensive reed beds or muskrat houses for nesting. |
| Grasshopper sparrow (*Ammodramus savannarum*) | Breeds in counties of the proposed Project area; S3B | Open prairies with intermittent shrubs |
| Great blue heron (*Ardea herodias*) | Occurs throughout Montana and breeds in counties in the proposed Project area; S3 | Colonial nester in riparian. cottonwood forests |
| Greater sage-grouse (*Centrocercus urophasianus*) | Breeds in counties of the proposed Project area; S2 | Breeds using lek system, uses sagebrush habitat for nesting and wintering |
| Horned grebe (*Podiceps auritus*) | Breeds in counties of the proposed Project area; S3B. | Breeds on shallow freshwater ponds and marshes with beds of emergent vegetation. |
| Pinyon jay (*Gymnorhinus cyanocephalus*) | Breeding not documented in counties of the proposed Project area; S3 | Colonial nester in juniper and pine trees. |
| Veery (*Catharus fuscescens*) | Breeding is documented in counties of the proposed Project area; S3B. | Shaded, moist deciduous forest habitats. |
| Yellow-billed cuckoo (*Coccyzus americanus*) | Breeding not recorded for counties of the proposed Project area; S3B | Willow and cottonwood riparian forests |
| **Reptiles and Amphibians of Conservation Concern** | | |
| Common sagebrush lizard (*Sceloporus graciosus*) | Potentially present throughout proposed Project area; S3 | Sagebrush and grassland communities and open juniper and ponderosa pine forests |
| Smooth greensnake (*Liochlorophis vernalis*) | Known only from Daniels, Roosevelt, and Sheridan counties: alternate routes could include occupied habitat; S2 | Grasslands, wetlands, and fringes of woodlands. |

Sources: Adams 2003, BLM 2009, Lenard et al. 2003, Maxell et al. 2003, Werner et al. 2004, Foresman 2001, MNHP 2009a, MNHP and MFWP 2009, Reichel and Flath 1995, van Zyll de Jong 1985.

[1] MNHP State Rankings (Rankings S1 through S3 are considered species of concern)

S1 – Critically imperiled

S2 – Imperiled because of rarity or factors that make it vulnerable to extinction

S3 – Rare, uncommon, or threatened, but not immediately imperiled

B – Breeding

## Grassland Birds

### *Bobolink*

The bobolink (*Dolichonyx oryzivorus*) is a bird of native and agricultural grasslands that prefers areas of dense, relatively tall grass with intermediate amounts of litter, including hayfields, wet meadows, and abandoned cropland (Ehrlich et al. 1988, MNHP 2009a). Nests are well concealed on the ground in dense cover. Their diet consists of seeds, insects, and insect larvae (MNHP 2009a). The breeding distribution of this bird includes grassland habitats across the entire state of Montana.

### *Grasshopper Sparrow*

Grasshopper sparrows (*Ammodramus savannarum*) prefer open prairies with intermittent brush and patches of bare ground, including grassland, cultivated fields, old fields, and open savanna (Ehrlich et al. 1988, MNHP 2009a). Nests are on the ground, usually in a depression, and are concealed by overhanging vegetation (Ehrlich et al. 1988). Their diet consists primarily of insects during the summer and invertebrates, grasses, and seeds during the winter (MNHP 2009a). This bird is distributed across Montana.

## Wetland and Water Birds

### *American White Pelican*

American white pelicans nest and forage in aquatic and wetland habitats, including rivers, lakes, reservoirs, and marshes. They are colonial nesters with four nesting colonies in Montana, including a colony on Medicine Lake in the vicinity of the proposed Project. Nesting colonies usually are on islands where they are isolated from mammalian predators. Pelican nesting colonies in Montana are shared with double-crested cormorants (*Phalacrocorax auritus*) and California gulls (*Larus californicus*) (MNHP 2009a).

### *Horned Grebe*

The predicted breeding range of horned grebe (*Podiceps auritus*) in Montana includes areas in the vicinity of the proposed Project located north of the Missouri River (MNHP 2009a). Confirmed or suspected breeding has been recorded for Phillips, Roosevelt, Valley, and Sheridan counties (MNHP 2009a). Breeding habitat includes shallow freshwater ponds and marshes with beds of emergent vegetation (Stedman 2000).

### *Black-necked Stilt*

The black-necked stilt (*Himantopus mexicanus*) is a large shorebird associated with wetlands. In Montana, stilts nest on medium to large wetland complexes with open marshes and meadows, often in alkali areas (MNHP 2009a). They forage in shallow water, feeding on invertebrates and small fish (Robinson et al. 1999). Breeding has been documented at Bowdoin National Wildlife Refuge in Phillips County (MNHP 2009a).

### *Black-crowned Night Heron*

The black-crowned night-heron, a colonial nester, occupies shallow marshes and other wetlands for breeding and foraging. There are over 30 known nesting locations in Montana. This bird often nests on islands that can afford them protection from predators, and often nests in association with the white-faced ibis (*Plegadis chihi*) and Franklin's gull (*Larus pipixcan* ) (MNHP 2009a).

### *Great Blue Heron*

Great blue herons (*Ardea herodias*) nest primarily in cottonwoods in riparian zones, but also use drier, coniferous sites. They are widespread in the vicinity of the proposed route and forage in streams, lakes, marshes, and other wetlands. Great blue herons generally nest in the largest available trees.

### *American Bittern*

The American bittern (*Botaurus lentiginosus*) is a secretive marsh-dwelling heron with an estimated breeding distribution across Montana, although records are sparse (MNHP 2009a). Most breeding records are from the northern portion of Montana and within managed wetlands, such as wildlife refuges (MNHP 2009a). Breeding habitat is freshwater wetlands with tall, emergent vegetation, and to a lesser extent sparsely vegetated wetlands. The diet of bitterns includes insects, amphibians, fish, crayfish, and small mammals.

### *Caspian Tern*

Caspian terns (*Hydroprogne caspia*) are migratory and begin arriving in Montana from late April to mid-May. Limited breeding has been documented in Montana, where they might occasionally nest on the same island as double-crested cormorants. The Caspian tern nests at about 10 locations in Montana, including islands in the Fort Peck Reservoir and Medicine Lake National Wildlife Refuge in the vicinity of the proposed Project.

### *Common Tern*

Common terns (*Sterna hirundo*) are colonial nesters, generally nesting on sparsely vegetated islands in large bodies of water, such as the Medicine Lake National Wildlife Refuge. Nesting habitat includes sandy, pebbly, or stony substrate with emergent vegetation covering more than 25 percent of the shoreline.

### *Forster's Tern*

Forster's tern (*Sterna forsteri*) breeds in large marshes, often greater than 100 acres and usually with substantial amounts of open water and large stands of dense emergent vegetation (MNHP 2009a). Nests are deeply hollowed, compactly woven platforms on floating mats of vegetation or on clumps of vegetation close to open water. Sometimes nests can consist of an unlined scrape in mud or sand (Ehrlich et al. 1988). Their diet consists of insects, fish, and frogs (Ehrlich et al. 1988).

## Forest Birds

### *Pinyon Jay*

Pinyon jays (*Gymnorhinus cyanocephalus*) are sporadically present year-round in open woodlands and prairies in eastern Montana, although there is limited evidence of breeding in the vicinity of the proposed Project (Lenard et al. 2003). They breed and roost in colonies, usually in juniper or pine trees (Ehrlich et al. 1988).

### *Veery*

The veery (*Catharus fuscescens*) inhabits damp, deciduous forests and riparian habitats and prefers forests with denser understory (Moskoff 2005). It also might use shrubby habitats with small trees. The veery forages on the ground, consuming insects and fruit, and nests on or near the ground (Moskoff 2005). The veery has a statewide predicted distribution (MNHP 2009a); its occurrence in eastern Montana would be limited to riparian habitats.

### *Black-billed Cuckoo*

The black-billed cuckoo (*Coccyzus erythropthalmus*) prefers thick-forested areas, usually near water. Although nesting has not been documented in the vicinity of the proposed Project, evidence of nesting in counties crossed by the proposed route has been reported (MNHP 2009a).

### *Yellow-billed Cuckoo*

Yellow-billed cuckoo (*Coccyzus americanus*) breeding habitat includes open woodland with thick undergrowth and deciduous riparian woodland, where yellow-billed cuckoos often nest in cottonwood and willow communities. The western subspecies of the yellow-billed cuckoo requires patches of at least 10 hectares (25 acres) of dense, riparian forest with a canopy cover of at least 50 percent in both the understory and overstory (MNHP 2009a). There is no direct evidence of breeding in Montana in publicly available records; however, observed breeding behavior indirectly suggests that nesting might occur in Montana.

## Bats

### *Eastern Red Bat*

The eastern red bat (*Lasiurus borealis*) is distributed from southern Canada southward throughout the continental U.S., Central America, and most of South America (Foresman 2001). Red bats are expected to occur throughout eastern Montana (MNHP 2009a). They are solitary and roost in foliage, most often along forest edges where they feed primarily on large insects near the top of the tree canopy (Foresman 2001).

### *Hoary Bat*

The hoary bat (*Lasiurus cinereus*), a summer resident in Montana, is a tree species that roosts in foliage (Foresman 2001). The distribution of the hoary bat includes the entire continental United States. The hoary bat is solitary during the breeding season, but concentrations might form during migration (van Zyll de Jong 1985). Most hoary bats are thought to winter in the southern United States and Mexico.

## Shrews

### *Arctic Shrew*

The arctic shrew (*Sorex arcticus*) is distributed across Canada, from the southern Yukon southward through British Columbia to Nova Scotia (Foresman 2001). The southern range extensions occur in North and South Dakota and eastward through Michigan. In Montana, the arctic shrew has been collected at the Medicine Lake National Wildlife Refuge (Sheridan County). This shrew appears to prefer moist sites, such as wet meadows, swamps, and marshes, but has been observed on sandy flats of floodplains

(MNHP 2009a). Arctic shrews are often sympatric with masked shrews (*Sorex cinereus*) (Foresman 2001), and they likely feed primarily on insects and other invertebrates similar to other shrews.

### *Dwarf Shrew*

The dwarf shrew (*Sorex nanus*) is distributed through north-central Montana; southward through Wyoming, Utah, Colorado, New Mexico, and Arizona; and eastward into southwestern South Dakota (Foresman 2001). The predicted distribution in Montana includes eastern Montana, south of the Missouri River. The dwarf shrew is found in a variety of habitats including rocky areas, meadows in alpine tundra and subalpine coniferous forest, rocky slopes and meadows in lower-elevation forest with a mixed shrub component, sedge marsh, subalpine meadow, arid sagebrush slopes, arid shortgrass prairie, dry stubble fields, and pinyon-juniper woodland (MNHP 2009a). While little is known of the food habits of dwarf shrew in the wild, in captivity they feed on vertebrate carcasses, as well as spiders and insects.

### *Merriam's Shrew*

The distribution of Merriam's shrew (*Sorex merriami*) is not well known, but it has been collected in the Great Basin, Columbia Plateau, and parts of the Great Plains and southeastern Rocky Mountains (Foresman 2001). Merriam's shrews have been documented in several central and eastern Montana counties, including Phillips, McCone, and Prairie counties where they were found in dry sagebrush or sagebrush-grassland habitats. They feed primarily on caterpillars, beetles, and crickets.

### *Preble's Shrew*

The Preble's shrew (*Sorex preblei*) occurs from eastern Washington to eastern Montana and southward to northeastern California, northern Nevada, Utah, and southwestern Wyoming (Foresman 2001). Specimens have been collected sporadically across Montana, and occurrence has been documented in Valley and Dawson counties. This shrew appears to prefer arid and semi-arid grass and sagebrush habitats in Montana, sometimes in openings surrounded by subalpine coniferous forest. Food habits are probably similar to other shrews, consisting mostly of insects and small invertebrates (MNHP 2009a).

## Reptiles

### *Common Sagebrush Lizard*

Common sagebrush lizards occur throughout the western United States. In Montana, they are present in the lower Missouri River basin and lower Yellowstone basin (Werner et al. 2004). This lizard occurs in sagebrush-steppe habitats, sometimes in the presence of sedimentary rock outcrops (limestone and sandstone), and in areas with open stands of limber pine (*Pinus flexilis*) and Utah juniper (*Juniperus osteosperma*) (MNHP 2009a).

### *Smooth Greensnake*

The smooth greensnake (*Liochlorophis vernalis*) has the most restricted distribution of any snake occurring in Montana, and it is known to only occur in Daniels, Roosevelt, and Sheridan counties. Very little is known about its breeding biology and general ecology in Montana (Werner et al. 2004). Habitat used by the smooth greensnake includes grasslands, wetlands, and fringes of wooded areas.

### I-3.4.2 POTENTIAL IMPACTS AND MITIGATION

Potential impacts of the proposed Project on wildlife and wildlife habitats are described in Section 3.6.2 of the main body of the EIS along with the procedures Keystone would incorporate into the proposed Project to minimize impacts. Those procedures are described in the Keystone CMR Plan (presented in Appendix B of the EIS) and the MDEQ Environmental Specifications (presented in Attachment 1 of this appendix).

The proposed Project would result in loss, alteration, and fragmentation of wildlife habitat used for hiding, foraging, breeding, nesting, and thermal cover. Construction would directly remove or degrade habitat, and wildlife dependent on the lost habitat would die or be displaced to adjacent habitats. Depending on variables such as species, behavior, density, and habitat, adjacent wildlife populations might experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

In addition to a direct loss of habitat, some wildlife would be displaced from adjacent habitats during construction as a result of the increase in human activity and noise associated with construction. Wildlife vary in their response to noise and human activities. Wildlife that might be most sensitive to displacement during construction activities would include breeding birds, including nesting raptors (e.g., red-tailed hawk) and greater sage-grouse and sharp-tailed grouse that are on leks.

Construction activities could result in direct mortality to some wildlife that would have limited mobility such as mice, voles, reptiles, amphibians, and young birds if they were present within the construction ROW during the active construction period. More mobile species such as swift fox and adult birds would move into adjacent habitats. A loss of migratory birds or their nests could occur where construction went through native prairie, rangelands, CRP fields, pastures, and riparian areas during the nesting season. Losses could be minimized by timing construction to avoid the period when birds were nesting and rearing young (May 1 through mid-August) or by avoiding known nest sites. However, it might not be practical to entirely avoid impacts to all migratory birds. According to Executive Order 13186 (Protection of Migratory Birds), adverse effects on migratory birds and their habitats must be minimized to the extent practical and should include restoration and enhancement of habitat, development and implementation of migratory bird conservation plans, and other measures to minimize mortality to migratory birds. Increased traffic during construction would result in slight increases in direct wildlife mortality from vehicle-wildlife collisions.

The construction of new roads, upgrading of existing roads, and the use of those roads generally would result in adverse impacts to a wide range of wildlife (Madson 2006, Montana Board of Oil and Gas Conservation [MBOGC] 1989, Wyoming Game and Fish Department [WYG&F] 2004), including elk and deer (Canfield et al. 1999), carnivores (Claar et al. 1999), small mammals (Hickman et al. 1999), birds (Hamann et al. 1999), and amphibians and reptiles (Maxell and Hokit 1999). In addition to the direct loss of habitat, negative impacts from roads could include direct mortality from vehicle-animal collisions, legal and illegal killing of wildlife, displacement of wildlife, increased stress, and fragmentation of habitat. In Montana, Keystone would use existing public and private access roads to the extent possible and all except three access roads would be temporary (i.e., used only during construction). After construction, the new, temporary access roads would be restored in accordance with the Keystone CMR Plan. As a result, the increased presence and use of roads would primarily occur during construction and would result primarily in a temporary and minor impact on wildlife in Montana.

In an assessment of modeled heat flux, Keystone determined that operation of the proposed Project would result in an increase of 5 to 8 ˚F in soil temperatures at the soil surface over the pipeline in Montana from November to May (Keystone 2009). At a depth of 6 inches below the ground surface, the modeled heat flux evaluation indicated that operation of the proposed Project would cause increases of 5 to 12 ˚F in soil temperature over the pipeline, with the greatest increases during March and April in Montana. The heat generated by the pipeline would warm the soils up to 11 feet from the centerline of the pipeline. Slight increases in soil temperatures could result in earlier plant growth in the spring and increased moisture stress to vegetation during the growing season. The vegetation community composition and seasonal development sequence of vegetation on the ROW, and consequently, available habitat for wildlife, could be altered by these changes in soil temperatures.

Total wildlife habitat loss from construction would be small in the context of available habitat and because Keystone would restore the ROW after construction in accordance with its CMR Plan. However, the effects of habitat loss on wildlife would depend on the amount, quality, and spatial arrangement of habitats adjacent to and near the ROW. Approximately 3,764 acres of land would be disturbed during construction (Table I-3.4-3), not including access roads. Mixed-grass prairie and sagebrush steppe cover types would account for approximately 62 percent of the disturbed area. These habitats are particularly important to grassland- and sagebrush-dependent wildlife. Although riparian and wooded draw cover types would comprise only 3 percent of the construction ROW, these habitats are disproportionately important to wildlife (Ohmart and Anderson 1986). Agricultural crop and hay lands would account for 27 percent of the construction ROW. Agricultural lands provide habitat for a variety of generalist animals and animals adapted to disturbed conditions such as mule deer, white-tailed deer, red fox, raccoon, common raven, and gray partridge.

**TABLE I-3.4-3**
**Estimated Wildlife Habitat Impacted by the Proposed Project in Montana**

| Cover Type | Length Through Cover Type (miles) | Area in Construction ROW (acres)[1] | Percent of Area in Construction ROW[1] |
|---|---|---|---|
| Open water | 0.3 | 4.0 | 0.1 |
| Developed land (e.g., roads, buildings, cleared areas) | 3.3 | 44.0 | 1.2 |
| Agricultural (crop and hay lands) | 74.8 | 997.3 | 26.5 |
| Wetlands | 0.2 | 2.7 | 0.1 |
| Riparian | 7.5 | 100.0 | 2.6 |
| Wooded draws | 1.9 | 25.3 | 0.7 |
| Badlands | 14.5 | 193.3 | 5.1 |
| Native range (mixed-grass prairie) | 145.1 | 1,934.70 | 51.4 |
| Sagebrush steppe | 32.1 | 428.0 | 11.4 |
| Greasewood flats | 1.0 | 13.3 | 0.3 |
| Conifer forest | 1.8 | 24.0 | 0.6 |
| **Total** | **282.5** | **3,766.6** | **100.0** |

Source: MNHP 2009b database was used for identification of established land categories along the proposed route; some lengths listed in this table differ from the more specific information obtained by Keystone during route surveys and provided elsewhere in this appendix.

[1] Acreage is based on a construction ROW width of 110 feet.

Habitat loss, alteration, and fragmentation would occur until vegetation was reestablished. However, the habitat might remain degraded after revegetation as a result of the maintenance of the permanent ROW, and the spread of noxious and invasive weeds. For wildlife that use trees and shrubs for cover, forage, and nesting, losses of these habitats in the 30-foot-wide maintained portion of the permanent ROW would last for the life of the proposed Project because that area would be maintained free of trees and large shrubs. In the portion of the construction ROW located outside of the maintained ROW, the loss would be long term because trees and shrubs would require 5 to 30 years or more to reestablish.

Loss of shrublands would be long term (from 5 to 30 years or longer) within reclaimed areas of the construction ROW. While reclamation would reestablish vegetation on the ROW, some areas dominated by native species would likely be converted to non-native species. Such conversion would likely reduce the value of the habitat for wildlife. If disturbances removed important habitats (nesting habitat), habitat loss and displacement could affect local and regional sagebrush-dependent species.

Construction, including establishment of new access roads, would increase habitat fragmentation by reducing the size of contiguous patches of habitat and through loss of habitat or changes in habitat structure. Habitat fragmentation effects are discussed in general and as they relate to specific types of wildlife within Section 3.6.2 of the EIS. Fragmentation effects would be most important relative to cumulative impacts and are discussed in the Cumulative Impacts section of the EIS (Section 3.14).

Construction through native grassland and shrub communities would remove vegetation including sagebrush and native grasses, temporarily creating an unvegetated strip along much of the construction ROW. Subsequent revegetation might not provide habitat features comparable to pre-Project conditions. Typically, seed mixes for reclamation would include non-native species that quickly become established. Sagebrush often does not quickly become established on ROWs and other disturbed sites, especially if these sites are seeded with grasses and other species that more rapidly germinate and grow. Maintenance of the permanent ROW would include removal of trees and shrubs; however, Keystone would allow sagebrush up to 2 feet in height to grow along the permanent ROW.

After revegetation of the ROW, seeded grasses would become attractive to livestock and wildlife. Cattle, sheep, and horses often graze more intensively on newly reclaimed areas than on adjacent rangeland. Livestock access to the ROW prior to development of a self-sustaining vegetation cover would inhibit successful reclamation of productive wildlife habitat, thereby extending the time required for habitat linkages to re-establish across the ROW.

Removal of vegetation from the ROW would also increase the potential for noxious weeds and other invasive species to colonize. Noxious weeds and other undesirable plants could then spread onto adjacent habitats not directly disturbed by construction. Noxious weeds could displace native plant species important to wildlife and degrade overall habitat values. However, to minimize the spread of noxious weeds, Keystone would follow the procedures in its CMR Plan and in the MDEQ Environmental Specifications. Therefore, as described in Section 3.5 of the EIS and in Section I-3.3 of this appendix, the impact of the spread of noxious weeds into adjacent habitats from construction of the proposed Project would likely be minor.

During construction, pipelines could present a significant temporary barrier to wildlife movement. An open trench and unburied welded pipe could prevent movement across the ROW. To minimize impacts to wildlife movements from the presence of an open trench during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) in the trench to allow wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that might fall into the trench. In addition, the trench would be backfilled as soon as possible after excavation and pipe lowering. As a result, the impact on wildlife, including small mammals, amphibians, and reptiles, would be temporary and likely minor unless construction coincided with migratory movements. To further reduce that impact, the following mitigation method was recommended by several agencies:

- During construction, when trenches are open, conduct daily inspections to locate and remove animals that have been trapped in the open trench.

During operation in Montana, Keystone would use existing roads for most access to the permanent ROW and would maintain only three new access roads for the life of the proposed Project. There would be occasional use of the new permanent access roads and the existing access roads and occasional human activity along the permanent ROW as a part of maintenance activities. In addition, although the permanent ROW would not have an associated access road, off-road vehicle users might travel on it in some areas; such use would not be legal without permission from Keystone and the property owner. The increased human access to those areas could increase displacement of wildlife that were sensitive to human presence. Further, increased access to land via the permanent ROW could increase hunting mortality for local game populations, although all hunting would be subject to the rules and regulations administered by the state. Because there would not likely be a substantial increase in human activity associated with the ROW in Montana, impacts to wildlife would likely be minor but would last for the life of the proposed Project.

Normal operation of the proposed Project would result in minor effects on wildlife. Direct impacts from maintenance activities, such as ROW maintenance or pipeline repair that would require excavating the pipeline, would be the same as those for construction but would affect a small area. The expected increase in wildlife-vehicle collisions from the use of the new and existing access roads would be negligible, and the impacts on wildlife in adjacent areas from the presence of the new roads and use of those roads and the existing access roads would be minor but would last for the life of the proposed Project. During operation, burrowing animals might be attracted by the warmth generated by the pipeline, especially during winter. Migratory waterfowl might be attracted to the permanent ROW during early spring if it became snow-free earlier than surrounding habitats. Changes from surrounding soil temperature at the ground surface would be most noticeable during spring. Operation of the pipeline would increase soil temperatures at depths near the pipeline by as much as 40 °F, by as much as 10 to 15 °F at a depth of 6 inches, and at the surface might increase by 4 to 8 °F during the spring (Keystone 2009).

#### I-3.4.2.1 Deer and Pronghorn Winter Range

Winter range is particularly important for ungulates (e.g., mule deer, white-tailed deer, and pronghorn) because of the lack of high-quality forage in winter, cold temperatures, and the increased energy demand. Depending on winter conditions, ungulates in the vicinity of the proposed route could be susceptible to adverse effects of construction and maintenance of the permanent ROW across winter ranges. Table I-3.4-4 presents the locations where the proposed route would cross the winter ranges for these animals. In Montana, the proposed route would cross a total of about 49.9 miles of white-tailed deer winter range in 11 locations, 119.4 miles of mule deer winter range in 19 locations, and 80.2 miles of pronghorn winter range in 14 locations.

Additional measures identified for mule deer and pronghorn summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- Within big game winter ranges, timing restrictions may be applicable for construction activities after November 15, based upon severity of winter conditions and consultation with FWP biologists.

| TABLE I-3.4-4<br>White-tailed Deer, Mule Deer, and Pronghorn Winter Ranges<br>Crossed by the Proposed Project in Montana | | | | |
|---|---|---|---|---|
| | **Location** | | | |
| **Range Type** | **Beginning Milepost** | **Ending Milepost** | **Total Length Crossed (miles)** | **Acreage Affected during Construction[1]** |
| White-tailed deer winter range | 54.38 | 57.42 | 3.0 | 40.5 |
| | 65.77 | 68.17 | 2.4 | 32.0 |
| | 79.79 | 84.92 | 5.1 | 68.4 |
| | 87.31 | 91.03 | 3.7 | 49.6 |
| | 121.30 | 124.35 | 3.1 | 40.7 |
| | 137.73 | 142.86 | 5.1 | 68.4 |
| | 152.97 | 171.01 | 18.0 | 240.5 |
| | 193.56 | 196.93 | 3.4 | 44.9 |
| | 244.51 | 247.23 | 2.7 | 36.3 |
| | 248.48 | 248.57 | 0.1 | 1.2 |
| | 279.12 | 282.28 | 3.2 | 42.1 |
| **Total** | | | **49.9** | **664.7** |
| Mule deer winter range | 9.13 | 28.2 | 19.03 | 253.7 |
| | 28.44 | 29.7 | 1.3 | 17.3 |
| | 32.81 | 33.8 | 1.0 | 13.6 |
| | 34.29 | 35.2 | 0.9 | 11.8 |
| | 35.77 | 36.6 | 0.8 | 10.4 |
| | 37.25 | 65.8 | 28.5 | 380.3 |
| | 66.96 | 67.0 | 0.1 | 1.1 |
| | 88.54 | 89.4 | 0.8 | 11.1 |
| | 89.72 | 130.9 | 40.5 | 539.5 |
| | 131.44 | 131.7 | 0.3 | 3.6 |
| | 152.97 | 161.9 | 8.9 | 118.8 |
| | 202.92 | 204.2 | 1.2 | 16.4 |
| | 211.98 | 225.7 | 13.2 | 175.7 |
| | 244.51 | 247.2 | 2.7 | 36.3 |
| | 248.48 | 248.6 | 0.1 | 1.2 |
| | 256.71 | 259.9 | 3.2 | 42.8 |
| | 260.95 | 264.8 | 3.8 | 50.9 |
| | 269.02 | 280.2 | 11.2 | 148.8 |
| | 280.69 | 281.6 | 0.1 | 12.0 |
| **Total** | | | **119.4** | **1,845.3** |

| TABLE I-3.4-4<br>White-tailed Deer, Mule Deer, and Pronghorn Winter Ranges<br>Crossed by the Proposed Project in Montana | | | | |
|---|---|---|---|---|
| | Location | | | |
| Range Type | Beginning Milepost | Ending Milepost | Total Length Crossed (miles) | Acreage Affected during Construction[1] |
| Pronghorn winter range | 11.39 | 12.38 | 1.0 | 13.2 |
| | 12.68 | 13.82 | 1.1 | 15.2 |
| | 14.08 | 20.27 | 6.2 | 82.5 |
| | 21.55 | 26.85 | 5.3 | 70.7 |
| | 38.75 | 65.77 | 27.0 | 360.3 |
| | 74.63 | 82.67 | 8.0 | 107.2 |
| | 83.73 | 83.74 | 0.0 | 0.1 |
| | 111.66 | 129.00 | 17.3 | 231.2 |
| | 162.17 | 163.12 | 0.1 | 12.7 |
| | 163.91 | 164.33 | 0.4 | 5.6 |
| | 219.19 | 219.49 | 0.3 | 4.0 |
| | 254.97 | 255.69 | 0.7 | 9.6 |
| | 258.25 | 258.89 | 0.6 | 8.5 |
| | 267.97 | 280.18 | 12.2 | 162.8 |
| **Total** | | | **80.2** | **1,083.6** |

Source: MFWP 2009b.
[1] Acreage is based on a ROW width of 110 feet.

### I-3.4.2.2 Prairie Grouse

#### Greater Sage-Grouse

Approximately 190 miles of the proposed route would extend through areas with sage-grouse habitat (MFWP 2001a). Of this distance, 94 miles are classified as moderate to high-quality habitat for greater sage-grouse and 96 miles are classified as marginal habitat. MFWP (2009b) has mapped core sage-grouse habitat[7] in Montana, where sage-grouse densities are highest and/or where leks and associated sage-grouse habitat occur. The proposed route would pass through approximately 20 miles of core sage-grouse habitat. One 2.75-mile-long permanent access road and one pump station would also be constructed within core sage-grouse habitat.

[7] MFWP (2009b) indicates that sage-grouse core areas are habitats associated with (1) Montana's highest densities of sage-grouse (25 percent quartile), based on male counts, and/or (2) sage-grouse lek complexes and associated habitat important to sage-grouse distribution. The data are intended for display of sage grouse core areas in Montana and initial resource review and conservation planning.

The revised Montana GAP[8] vegetation data indicated that the proposed route would cross approximately 34 miles of sagebrush steppe habitat in Montana, with the potential for directly removing 446 acres of this habitat and indirectly affecting a larger buffer area around sage-grouse leks (Table I-3.4-5). The proposed route would also cross within 1 mile of at least five greater sage-grouse leks and within 4 miles of at least 36 greater sage-grouse leks in Montana. Using a 4-mile buffer around only the known greater sage-grouse leks that occur within 4 miles of the proposed route, the proposed Project route would cross approximately 111.7 miles of greater sage-grouse buffer zone in nine locations (Table I-3.4-5).

**TABLE I-3.4-5**
**Greater Sage-Grouse Lek 4-Mile Buffer Zones Crossed by the Proposed Project in Montana**

| Location by Milepost | | Buffer Zone Length Crossed (miles) | Buffer Zone Acreage Affected during Construction[1] |
|---|---|---|---|
| Beginning Milepost | Ending Milepost | | |
| 17.0 | 25.3 | 8.3 | 111.3 |
| 43.2 | 49.9 | 6.7 | 89.8 |
| 50.2 | 61.8 | 11.6 | 155.4 |
| 67.1 | 72.1 | 5.0 | 66.6 |
| 87.7 | 121.9 | 34.2 | 455.4 |
| 207.7 | 220.0 | 12.3 | 164.4 |
| 229.3 | 243.6 | 14.3 | 191.3 |
| 247.1 | 264.5 | 17.4 | 232.1 |
| 280.4 | 282.3 | 1.9 | 26.0 |
| **Totals** | **9 locations** | **111.7** | **1,492.3** |

Sources: MFWP 2009a, 2009b, 2009c.
[1] Acreage is based on a ROW width of 110 feet.

Studies of the effects of energy development on greater sage-grouse indicate a variety of adverse impacts to sage-grouse from sources of disturbance, such as construction and operation of facilities, road construction and use, and development of transmission lines (Naugle et al. 2009). However, many studies evaluated impacts resulting from different and higher-density types of disturbance and development than the proposed Project (i.e., a single pipeline as compared to oil and gas field developments). Although similar types of impacts would likely occur from construction of the proposed Project, the magnitude would likely be different.

Sage-grouse would be especially vulnerable to pipeline construction activities in the spring when birds were concentrated on strutting grounds (leks) and where the pipeline and access roads were constructed through sagebrush communities with leks and nesting sage-grouse. Partial field surveys and public databases indicate that at least 36 known sage-grouse leks are present within 4 miles of the proposed route, and at least five leks are present within 1 mile of the route (MFWP 2009a, 2009b, and 2009c). Construction near leks could displace breeding birds from leks or disturb nests, resulting in a decrease in local reproduction. Traffic on roads near active leks could cause vehicle collision mortality.

[8] The Gap Analysis Program, or GAP, is a scientific program intended to identify species that are not adequately represented on existing conservation lands. For this EIS, information was used from the recently updated ecological land cover mapping developed as a part of the Gap Analysis.

Disruption of courtship and breeding behavior could be minimized by scheduling construction after birds had left the leks (usually by mid-May). Mortality to sage-grouse and the loss of nests, eggs, and young could be avoided by scheduling construction through occupied sagebrush steppe habitats after young sage-grouse became mobile and were able to fly (usually by mid-August). Sage-grouse chicks are precocious and capable of leaving the nest immediately after hatching, but they are not sufficiently mobile to avoid construction related impacts until after they can fly.

After construction, reestablishment of sagebrush on the ROW might take 30 years or more. During this period, vegetation on reclaimed areas would likely be dominated by grasses with low densities of native forbs and shrubs. Typically, communities of big sagebrush have proven to be difficult to reestablish on reclaimed lands (Schuman and Booth 1998, Vicklund et al. 2004). Growth of big sagebrush on reclaimed land has been shown to benefit from the application of mulch, compacting soil after seeding, and reduced competition with herbaceous species (lower seeding rate of grasses and forbs) (Schuman and Booth 1998). Management of a 30-foot-wide area of the permanent ROW to prevent shrub and tree growth could prevent reestablishment of sagebrush communities for at least the life of the proposed Project. A maintained path over the pipeline that was free of shrubs could facilitate predator movement along the ROW and increase predation risk for grouse nesting or foraging on or near the ROW. Maintenance of the ROW and the three new permanent access roads might also encourage recreational use of the ROW. Recreational use (e.g., motorized vehicles, wildlife viewing, etc.) of the area during the breeding season could have an adverse effect on sage-grouse reproduction.

In Montana, the new permanent access roads would be constructed within 4 miles of at least three greater sage-grouse leks; one new access road would be constructed within 2 miles of at least one greater sage-grouse lek. The 4-mile distance from the six new pump stations would include at least eight greater sage-grouse leks; however, all leks would be at least 2 miles from the nearest pump station. Sound generated by the pump stations would attenuate to background levels within about 0.5 mile of the pump stations, and because the pump stations are at least 2 miles from nearest lek, the increased sound levels from operation of the pump stations would not affect the use of known sage-grouse leks.

If construction and future activities were to disturb the 36 or more leks and associated nesting habitat near the ROW during the breeding season, local and regional populations of greater sage-grouse could decline. Limiting construction to periods outside of the breeding season would protect nesting grouse and offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the proposed Project on greater sage-grouse. The key measures are summarized below and are included in detail in the MDEQ Environmental Specifications for the proposed Project (see Attachment 1 to this appendix), along with other mitigation measures:

- Conduct surveys of greater sage-grouse leks prior to construction using appropriate methods to detect leks and the peak number of males in attendance at the leks within 3 miles of the edge of the construction ROW or a facility, unless a facility is screened by topography;
- Avoid construction within 3 miles of active greater sage-grouse leks in suitable nesting habitat not screened by topography from March 1 to June 15, with the following exceptions -
    - Equipment may pass as a single group along the permitted ROW or approved location through a restricted lek buffer area
    - Equipment would only pass through a restricted lek buffer between 10:00 am and 2:00pm, to avoid disturbing displaying birds during critical times of the day
    - If major grading is required to pass equipment along the permitted ROW or approved location, this grading would take place outside of the March 1 through June 15 restriction period and

  - As equipment passes through the areas, if any large hummocks or rocks impede the travel lane, the lead dozer would lower its blade on the way through to move the obstruction to the side and/or smooth out any larger hummocks or rocks;

- In sagebrush habitat, reduce the mound left over the trench in areas where settling would not present a path for funneling runoff down slopes, where settling could occur implement additional measures to compact backfilled spoils;
- Contact BLM and MFWP to determine what mitigation measures are needed for a lek found within the construction ROW;
- During operation, inspection flights would be limited to afternoons from March 1 to June 15, as practicable in sage brush habitat designated by MFWP;
- Implement reclamation measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeded rates for non-native grasses and forbs) that favor the establishment of silver sagebrush and big sagebrush in disturbed areas, where compatible with the surrounding land use and habitats;
- Establish a compensatory mitigation fund of $600 per acre to be used by MDEQ, BLM, and MFWP to enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species in eastern Montana at designated mileposts;
- Under the direction of MDEQ, MFWP, and BLM, fund a study for four years to determine whether the presence of proposed Project facilities have affected sage-grouse numbers, based on the peak number of male greater sage-grouse in attendance at leks within 3 miles of facilities. If a decrease is observed, it will be offset with an increase in the number of greater sage-grouse elsewhere;
- Prior to construction, conduct studies along the route to identify areas that support stands of big sagebrush and silver sagebrush and incorporate these data into reclamation activities to prioritize reestablishment of sagebrush communities;
- Monitor establishment of sagebrush on reclaimed areas annually for at least four years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities, and implement additional seeding or plantings of sagebrush if necessary;
- Under the direction of MDEQ, MFWP, and BLM, establish criteria to determine when reclamation of sagebrush communities has been successful, based on the pre- and post construction studies described above, and meet revegetation standards specified in Attachment 1;
- Use locally adapted sagebrush seed, collected within 100 miles of the areas to be reclaimed;
- Where facilities would permanently remove sagebrush communities, implement compensatory mitigation nearby to restore, enhance, and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species;
- For five years following initial seeding, monitor cover and densities of native and non-native perennial forbs and perennial grasses, exclusive of noxious weeds, on reclaimed native prairie, pasture, and riparian areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities;
- In conjunction with the landowner, appropriately manage livestock grazing of reclaimed areas until successful reclamation of sagebrush communities has been achieved, as described above; and

- Implement measures to reduce or eliminate colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass (*Bromus tectorum*), to the extent that these species do not exist in undisturbed areas adjacent to the ROW.

With incorporation of the Keystone CMR Plan and the mitigation measures described above and additionally presented in the MDEQ Environmental Specifications (see Attachment 1 to this appendix), construction and operation of the proposed Project would not likely affect greater sage-grouse courtship activities on leks and would likely result in a minor impact on nesting birds. However, construction would likely result in an incremental loss of big sagebrush habitat that is currently used for foraging and nesting by greater sage-grouse for 30 years or longer.

### Sharp-Tailed Grouse

The proposed route would cross approximately 55.8 miles of sharp-tailed grouse habitat (Table I-3.4-6). Effects to sharp-tailed grouse as a result of disturbance from construction and maintenance activities would be similar to those described for the greater sage-grouse. Although energy development has been occurring in the Great Plains, the effects of this development on sharp-tailed grouse have received little attention. One short-term study in the Little Missouri Grasslands of North Dakota (Williams 2009) found no differences in reproductive success from oil and gas development. However, that same study recommended protecting leks and surrounding habitats, because leks are the focal point for reproduction.

In Montana, the three new permanent access roads would be constructed within 4 miles of at least six sharp-tailed grouse leks; one of the new access roads would be constructed within 1 mile of at least one sharp-tailed grouse lek. The 4-mile distance from the six new pump stations would include at least seven sharp-tailed grouse leks; however, all leks would be at least 2 miles from the nearest pump station. Sound generated by the pump stations would attenuate to background levels within about 0.5 mile of the pump stations and, because the pump stations are at least 2 miles from nearest lek, the increased sound levels from operation of the pump stations would not affect the use of known sharp-tailed grouse leks.

Disturbance of leks and nesting habitat might result in reduced reproduction of sharp-tailed grouse present in the vicinity of the ROW. At least eight known sharp-tailed grouse leks would be within 1 mile of the proposed route and at least 19 leks would be within 2 miles of the route (Table I-3.4-6). However, MFWP has not monitored or surveyed sharp-tailed grouse leks as intensively as greater sage-grouse leks. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the route in Montana) and identified 16 new sharp-tailed grouse leks near the ROW (P. Gunderson, pers. comm. 2009; W. Davis, pers. comm. 2009). It is likely that more sharp-tailed grouse leks are present near the ROW and some might be within 2 miles of the proposed route.

Sharp-tailed grouse have broader habitat tolerances than do sage-grouse (Connelly et al. 1998, Schroeder et al. 2004). Consequently, effects to sharp-tailed grouse from habitat loss and alteration would likely be minor, and reclaimed grassland and grassland-shrub habitats would likely provide suitable habitat for sharp-tailed grouse. The maintained ROW could attract recreational use (e.g., motorized vehicles, wildlife viewing, and photography) and increased recreational use during the breeding season could reduce local sharp-tailed grouse reproduction. The maintained ROW might also facilitate predator movement along the ROW, increasing predation risk for sharp-tailed grouse nesting or foraging on or near the ROW.

| TABLE I-3.4-6<br>Sharp-tailed Grouse Lek 2-Mile Buffer Zones Crossed by the Proposed Project in Montana | | | |
|---|---|---|---|
| **Location by Milepost** | | | |
| **Beginning Milepost** | **Ending Milepost** | **Buffer Zone Length Crossed (miles)** | **Buffer Zone Acreage Affected during Construction[1]** |
| 49.6 | 65.0 | 15.4 | 71.6 |
| 94.6 | 110.8 | 16.2 | 216.1 |
| 159.2 | 160.5 | 1.3 | 17.3 |
| 175.9 | 181.8 | 5.9 | 78.8 |
| 188.1 | 190.3 | 2.2 | 28.7 |
| 209.5 | 213.2 | 3.7 | 49.2 |
| 213.3 | 217.7 | 4.4 | 58.4 |
| 229.7 | 233.5 | 3.8 | 50.7 |
| 254.7 | 257.6 | 2.9 | 38.3 |
| **Totals** | **9 locations** | **55.8** | **609.1** |

Sources: MFWP 2009a, 2009b, 2009c.
[1] Acreage is based on a ROW width of 110 feet.

If construction and future activities were to disturb the 19 or more leks and associated nesting habitat near the ROW during the breeding season, local populations of sharp-tailed grouse could decline. Limiting construction activities to periods outside of the breeding season would protect nesting grouse and their offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the proposed Project on sharp-tailed grouse. Those measures include the mitigation measures identified for the greater sage-grouse above (except for the surveys and construction restrictions specific to greater sage-grouse) as well as the additional measures summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix):

- Conduct surveys of sharp-tailed grouse leks prior to construction using methods approved by MDEQ and MFWP, to detect leks that can be seen from the construction ROW and associated power lines; and
- Avoid construction within 0.25 mile of active sharp-tailed grouse leks that can be seen from the construction ROW from March 1 to June 15.

With incorporation of the Keystone CMR Plan into the proposed Project and implementation of the mitigation measures described above, construction and operation of the proposed Project would not likely affect sharp-tailed grouse courtship activities on leks and would have a minor impact on nesting birds. However, construction might result in subtle fragmentation effects that could affect individual grouse (e.g., increased risk of predation) in areas next to the maintained ROW.

### I-3.4.2.3 Special-Status Wildlife

The impacts of the proposed Project in Montana on species of concern are discussed by the following groups that were established based on habitats used: grassland birds, wetland and water birds, forest birds, bats, shrews, and reptiles.

### Grassland Birds

Grassland bird populations in the Great Plains have declined in abundance primarily due to loss of habitat (Madden et al. 2000). Breeding bird surveys indicate that almost 70 percent of the 29 grassland-dependent birds have negative population trends (U.S. Department of the Interior 1996). Grassland birds of concern that would be affected by habitat losses associated with construction would include the bobolink and grasshopper sparrow.

The proposed route would cross approximately 145.1 miles of mixed-grass prairie habitat (Table I-3.4-3). If construction were to take place during the nesting and brood-rearing period, some mortality would likely occur to birds of concern. Fragmentation of grassland habitats could increase mortality risk to grasslands birds from predation and nest parasitism by brown-headed cowbirds. Grasslands in the vicinity of the proposed route vary in plant composition and structural features. Madden et al. (2000) indicated that a mosaic of successional types was necessary to maximize diversity of grassland birds. Post-construction vegetation within the restored ROW would likely initially be less diverse than adjacent undisturbed grassland habitats. Some grassland birds would adapt to the reclaimed vegetation while others might be displaced by the vegetation change. Construction could destroy bobolink and grasshopper sparrow nests if they were present within the construction ROW. Construction would also result in a short-term to long-term loss and long-term alteration of native grassland habitat used for foraging and nesting by these species.

Although no specific mitigation measures have been proposed for the bobolink and grasshopper sparrow, Keystone would develop a Migratory Bird Conservation Plan in consultation with the USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit the bobolink and grasshopper sparrow. The impact of the proposed Project on these grassland birds would likely be short term and potentially moderate in magnitude for direct construction-related impacts, and long term in duration and minor to moderate in magnitude for habitat-related impacts.

### Wetland and Water Birds

The proposed route would cross about 5.3 miles of wetlands and riparian forests (see Section I-3.2) and about 3.3 miles of riverine and open water habitats (see Section 3.4 of the EIS). Montana birds of concern associated with large wetland complexes and water bodies discussed in this section would include the American bittern, American white pelican, black-crowned night heron, black-necked stilt, Caspian tern, common tern, Forster’s tern, great blue heron, and horned grebe. No large wetlands or water bodies that provide nesting habitat for these species would be directly affected by construction. The great blue heron is a colonial nester in cottonwood forests along major perennial streams and no nesting colonies were documented along the proposed route. However, potential heron nesting habitat might be present within 0.9 mile of forested wetlands that would be crossed by the proposed route. The American white pelican, Caspian tern, common tern, and Forster’s tern also are colonial nesters, nesting in water bodies and wetlands, often on islands. Several of these species forage widely in the vicinity of the proposed route (e.g., great blue heron and white pelican).

Avoidance and mitigation measures to reduce impacts to wetlands would minimize adverse effects to these species. Many of these sensitive water birds nest colonially on large wetland complexes with open water. No large wetland complexes would be crossed by the proposed route. Risk to these wetland and water birds would be relatively small because these species are most common in the northeast corner of Montana near Medicine Lake, an area that would not be crossed by the proposed route. Keystone would incorporate the procedures in its CMR Plan and in the MDEQ Environmental Specifications to avoid or minimize impacts to wetlands, as described in Sections 3.4 and 3.7 of the EIS, and use of the horizontal directional drilling (HDD) method of pipeline installation under large water bodies would also minimize impacts to wetland and water birds.

Although no specific mitigation measures have been proposed for wetland birds and water birds, Keystone would develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid, minimize, and mitigate impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit wetland birds and water birds. The impact of the proposed Project on these species would likely be primarily short term during construction and minor in magnitude.

### Forest Birds

The proposed route would cross about 11.2 miles of forested habitats (i.e., riparian, wooded draws, and conifer forest) (Table I-3.4-3). Special-status birds associated with forested habitats include the black-billed cuckoo, pinyon jay, veery, and yellow-billed cuckoo. Construction through forested habitats would remove trees and shrubs important for nesting and foraging. If construction occurred during the nesting period, eggs and young could be lost. Although riparian forest and upland wooded draws comprise a small part of the landscape, they have disproportionately large wildlife values (Ohmart and Anderson 1986, Thomas et al. 1979). Thompson (1978) found that the highest total biomass and species diversity of breeding birds in McCone County habitats in Montana was within wooded draws. Habitat impacts to forest birds would be long term because trees would not be allowed to recolonize within the maintained ROW, and the regeneration of trees within the construction ROW would require 10 to 30 years or more. Many cavity nesting birds re-use nest cavities, and displacement from occupied habitats because of the loss of nest trees might result in reduced productivity in subsequent years.

Although no specific mitigation measures have been proposed for forest birds, Keystone would follow the procedures in its CMR Plan and in the MDEQ Environmental Specifications to minimize impacts to forested wetlands and uplands (described in Section 3.5 of the EIS). In addition, Keystone would develop a Migratory Bird Conservation Plan in consultation with the USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit special-status forest birds. The impact of the proposed Project on forest birds would likely be moderate in magnitude and would last for at least the life of the proposed Project.

Keystone would implement the mitigation measures in the CMR Plan that are designed to reduce the impact to wildlife. Additional mitigation measures designed to further reduce the impact to grassland, wetland, water, and forest birds were identified by agencies and tribes. The mitigation measures that the DOS considers to be appropriate to incorporate into the proposed Project area are listed below:

- Defer activities that affect nesting habitat until after the nesting and brood-rearing period (from April 15 to July 15); and
- If construction would occur during the period from April 15 to July 15, conduct surveys for nesting migratory birds and maintain a 100-foot buffer of undisturbed vegetation around all discovered nests until the young have fledged.

Additional measures identified for the special status birds are summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- To protect nesting for Sprague's pipit, a sensitive species in Montana, if construction would occur during the April 15 to July 15 grassland ground-nesting bird nesting season, nest-drag surveys must be completed to determine the presence or absence of nests on lands in Phillips and Valley counties and implement timing restrictions recommended by USFWS and MFWP;

- To minimize destruction of mountain plover nests and disturbance of breeding mountain plovers; no construction, reclamation, or other non-emergency ground disturbing activities will occur from April 10 to July 10 in suitable nesting habitats in Fallon and northern and central Valley counties unless surveys conducted consistent with the Plover Guidelines or other methods approved by the USFWS find that no plovers are nesting in the area. If an active nest is identified, construction activities within 0.25 mile of the nest would be delayed for 37 days (typical fledging duration) or until fledging, whichever is sooner. If a brood of flightless chicks is identified, construction activities would be delayed for at least seven days or until fledging, whichever is sooner. Routine, non-emergency, maintenance activities would be scheduled outside the April 10 to July 10 period in mountain plover habitat unless surveys indicate that no plovers are nesting in the area and that flightless chicks are not present;
- Conduct pre-construction surveys for interior least tern within 0.25 mile from suitable breeding habitat at the Yellowstone River during the breeding season to ensure that there are no nesting pairs within 0.25 miles of the construction area. Conduct daily surveys for nesting terns during the nesting season if construction activities would occur within 0.25 miles of potential nesting habitat. Construction would not be permitted within 0.25 mile from an occupied nest site during the breeding season (April 15 through August 15) or until the fledglings have left the nesting area;
- Prior to and during construction, conduct surveys for active bald eagle nests and communal roost sites prior to construction, if any active nests are found implement measures in the Montana Bald Eagle Management Plan (if active) or implement the current guidance from the US Fish and Wildlife Service;
- Prior to March 15 each year of construction conduct survey of approved location and nearby areas for the presence of golden eagle nests, if an active golden nest is found, restrict construction, reclamation and non-emergency maintenance activities within 1000 m of the nest from March 15 until July 15 or until the young have fledged;
- Conduct surveys for ferruginous hawk nests, if an active nest is found, no construction, reclamation, or non-emergency maintenance activities would take place within 1000 m of the nest between March 15 and July 15 or until young have fledged;
- Conduct surveys for nesting burrowing owls in Phillips, Valley, southern McCone, and southern Dawson counties during the period between April 15 and August 1, if nesting burrowing owls are found, no construction, reclamation, or non-emergency maintenance activities will occur within 500 m of an active nest until chicks have fledged;
- Conduct surveys for nests of other raptor species, if an active nest is found, no construction and reclamation activities would occur within 1000 m of an active nest between March 15 and July 15 or until the young have fledged; and
- Great blue heron rookeries would be avoided by 500 feet.

### Bats

Eastern red bat and hoary bat are solitary, roost in foliage, and are migratory. Concentrations of these bats might form during fall migration. No communal bat roost sites have been recorded along the proposed Project route. However, impacts to these species in the vicinity of the proposed route would result from the short-term reduction of potential foraging habitat and habitat fragmentation until reclamation was completed and native vegetation became reestablished. The proposed route would cross about 11.2 miles of forest habitat and result in the loss of approximately 149.3 acres of forest from the construction ROW (Table I-3.4-3), and trees would be permanently removed from the 50-foot-wide permanent ROW.

Although no mitigation measures have been developed specifically for the eastern red bat or the hoary bat, the procedures that Keystone would incorporate into the proposed Project to minimize the impacts to forested wetland and upland habitats and migratory birds (described above) would also benefit bats. The impact of the proposed Project on bats would likely be moderate in magnitude and would last for at least the life of the proposed Project.

Additional measures identified for bats are summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- Conduct surveys in forested riparian habitat between June 1 and August 15 using the methods described in the Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta to determine the location of bat maternity roosts or roost trees; if active bat roosts are identified, roosts should be avoided where possible until bats have left the area in late summer or fall and removal of roost trees should be avoided wherever practicable; and
- Minimize tree clearing by narrowing of the construction ROW and final centerline location near crossings of certain streams identified in Appendix L of these specifications.

### Shrews

Little is known about specific habitat use and distribution of special-status shrews in eastern Montana. If special-status shrews were present in the construction ROW during construction, they would likely be affected by construction activities. Impacts to the arctic shrew, dwarf shrew, Merriam's shrew, and Preble's shrew could occur during the clearing of prairie and shrubland vegetation and during trenching, which would collapse dens and tunnels if they were present within the construction ROW. Adults and young within the construction ROW could also be killed by excavation and vehicle traffic. On state and federal land, the construction ROW would be seeded with plants appropriate for soil and range conditions in the area. During operation, the permanent ROW would provide suitable habitat for shrews, including uncompacted soils for dens and burrows, and plants and insects for forage.

Although no specific mitigation measures have been proposed for special-status shrews, the procedures that Keystone would incorporate into the proposed Project to minimize the impacts to vegetation and wildlife (discussed in Sections 3.5 and 3.6 of the EIS) would benefit these shrews if they occurred along the construction ROW.

### Reptiles

Impacts to special-status reptiles (common sagebrush lizard and smooth greensnake) would most likely occur during construction. If either of these species were present in the construction ROW during the active construction period, there could be direct mortality of individuals from construction activities and vehicle traffic. These reptiles could also be trapped in open pipeline trenches. However, as noted above, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench was excavated and replaced with minimal compaction) to allow wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that might fall into the trench. In addition, the trench would be backfilled as soon as possible after excavation and pipe lowering. Access roads might serve as barriers to the movement of reptiles and serve as a source of mortality during operations for reptiles (Maxell and Hokit 1999). However, Keystone would primarily use existing access roads during construction and would use all but three new access roads only during construction. Impacts also would result from the long-term reduction of suitable habitat until reclamation of the construction ROW and access roads was completed and vegetation became reestablished.

Common sagebrush lizards would likely occur within sagebrush steppe habitat crossed by the proposed route and would be vulnerable to direct mortality from construction activities and access road construction and use. An estimated 32.1 miles and 428 acres of sagebrush steppe habitat would be lost or altered during construction (Table I-3.4-3). This habitat loss and alteration would produce moderate and long-term impacts on sagebrush habitat because it would require about 20 to 50 years to fully regenerate. Although no specific mitigation measures have been proposed for the common sagebrush lizard, mitigation measures developed for conservation of sagebrush habitat and the greater sage-grouse discussed in Section 3.8 of the EIS would benefit the common sagebrush lizard. The impact of the proposed Project on this special-status lizard would be moderate and would be long term to permanent (i.e., last for the life of the proposed Project).

The known distribution of the smooth greensnake is in northeastern Montana, and therefore this species would not likely be affected by the proposed Project.

As described above, to minimize impacts Keystone would incorporate the procedures in its CMR Plan (presented in Appendix B of the EIS) and the measures presented in the MDEQ Environmental Specifications (see Attachment 1 to this appendix). As a result, the impacts to special-status species would likely be minor and temporary during construction. During operation, the impacts would be minor but would last for the life of the proposed Project.

Additional measures identified for small mammals, reptiles, and amphibians are summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- During construction, when trenches are open, conduct daily inspections to locate and remove animals that have been trapped in the open trench;
- To protect small animals from entanglement, do not use erosion control netting composed of material incorporating plastic netting with openings less than two inches across which can entangle small animals;
- If a western hog-nosed snake or milksnake hibernacula are found within the construction ROW during construction restrict construction between October 1 and May 1 to prevent the loss of a large number of individual snakes;
- To protect habitat of the Great Plains toad and plains spadefoot, restrict construction within 100 m of ephemeral wetlands from April 15 to July 15.

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## I-3.5 FISHERIES

Section 3.7 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on fisheries resources, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA. It includes supplemental information about proposed crossings of intermittent and ephemeral waterbodies that have been identified as contributing to maintaining water quality, and that might provide seasonal habitat that contributes to the viability of fish populations of recreational or commercial value. This section also provides additional information on Montana fish of conservation concern that could be affected by perennial stream crossings and the use of hydrostatic test water.

### I-3.5.1 AFFECTED ENVIRONMENT

#### I-3.5.1.1 Waterbodies

The proposed route would cross 42 intermittent or ephemeral streams that connect to waters supporting recreational or commercial fishery resources in Montana. These streams, which are listed in Table I-3.5-1, likely contribute to maintaining water quality and might provide seasonally used habitat that contributes to the maintenance of non-salmonid fisheries in Montana (Berry et al. 2004, MDEQ 2006a and 2006b).

**TABLE I-3.5-1**
**Fishery Categories for Intermittent and Ephemeral Waterbodies Crossed by the Proposed Project Route in Montana**

| County | Approximate Milepost | Waterbody Name | Stream Flow Regime[1] | Proposed Crossing Technique[2] | Number of Crossings |
|---|---|---|---|---|---|
| Phillips | 9.1 | Dunham Coulee | Ephemeral | OC | 1 |
| Phillips | 20.8 – 24.0 | Corral Coulee | Ephemeral/ Intermittent | OC | 3 |
| Valley | 32.5 | East Fort Cache Creek | Ephemeral | OC | 1 |
| Valley | 38.0 | Hay Coulee | Intermittent | OC | 1 |
| Valley | 44.9 | Lime Creek | Intermittent | OC | 1 |
| Valley | 51.1 | Brush Fork | Intermittent | OC | 1 |
| Valley | 52.3 | Bear Creek | Intermittent | OC | 1 |
| Valley | 53.3 | Unger Coulee | Intermittent | OC | 1 |
| Valley | 55.3 | Buggy Creek | Intermittent | OC | 1 |
| Valley | 57.0 | Alkali Coulee | Ephemeral | OC | 1 |
| Valley | 59.3 | Wire Grass Coulee | Ephemeral | OC | 1 |
| Valley | 59.8 | Spring Creek | Intermittent | OC | 1 |
| Valley | 61.7 | Mooney Coulee | Ephemeral | OC | 1 |
| Valley | 66.9 | Cherry Creek | Intermittent | OC | 1 |
| Valley | 68.4 | Foss Coulee | Intermittent | OC | 1 |
| Valley | 70.4 | Spring Coulee | Intermittent | OC | 1 |

**TABLE I-3.5-1**
**Fishery Categories for Intermittent and Ephemeral Waterbodies Crossed by the Proposed Project Route in Montana**

| County | Approximate Milepost | Waterbody Name | Stream Flow Regime[1] | Proposed Crossing Technique[2] | Number of Crossings |
|---|---|---|---|---|---|
| Valley | 70.9 | East Fork Cherry Creek | Intermittent | OC | 1 |
| Valley | 75.9 | Lindeke Coulee | Ephemeral | OC | 1 |
| Valley | 77.9 | Espiel Coulee | Intermittent | OC | 1 |
| McCone | 95.3 | Jorgensen Coulee | Ephemeral | OC | 1 |
| McCone | 96.7 | Lost Creek | Ephemeral | OC | 1 |
| McCone | 101.3 – 101.4 | Cheer Creek | Ephemeral | OC | 2 |
| McCone | 105.3 | Bear Creek | Ephemeral | OC | 1 |
| McCone | 110.4 – 110.5 | Shade Creek | Intermittent | OC | 2 |
| McCone | 114.2 | South Fork Shade Creek | Intermittent | OC | 1 |
| McCone | 118.3 – 118.6 | Flying V Creek | Ephemeral/ Intermittent | OC | 2 |
| McCone | 122.3 | Figure Eight Creek | Intermittent | OC | 1 |
| McCone | 123.1 | Middle Fork Prairie Elk Creek | Ephemeral | OC | 1 |
| McCone | 146.2 | Lone Tree Creek | Intermittent | OC | 1 |
| McCone | 147.5 – 153.3 | Buffalo Springs Creek | Perennial/ Intermittent | OC | 3 |
| Dawson | 156.7 | Cottonwood Creek | Intermittent | OC | 1 |
| Dawson | 163.1 | Hay Creek | Intermittent | OC | 1 |
| Dawson | 166.2 | Upper Seven Mile Creek | Intermittent | OC | 1 |
| Dawson | 188.1 | Cracker Box Creek | Ephemeral | OC | 1 |
| Prairie | 208.0 | West Fork Hay Creek | Intermittent | OC | 1 |
| Prairie | 209.1 | Hay Creek | Intermittent | OC | 1 |
| Fallon | 244.3 | Sandstone Creek | Intermittent | OC | 1 |
| Fallon | 246.2 | Red Butte Creek | Intermittent | OC | 1 |
| Fallon | 258.4 | Hidden Water Creek | Intermittent | OC | 1 |
| Fallon | 272.1-272.2 | Soda Creek | Intermittent | OC | 2 |
| Fallon | 276.1 | North Fork Coal Bank Creek | Intermittent | OC | 1 |
| Fallon | 279.2 | South Fork Coal Bank Creek | Intermittent | OC | 1 |

[1] Perennial = a stream that flows continuously throughout the year; Ephemeral = a stream which flows only after rain or snow-melt and has no base flow component; Intermittent = a stream in contact with the ground water table that flows only certain times of the year, such as when the groundwater table is high or when it receives water from the surface sources.

[2] OC = open cut and consists of conventional upland construction techniques if the streambed is dry or open-cut wet methods for flowing, flume, or dam and pump crossings (see Sections 2.3.4.5 and 2.3.4.6 of the EIS for additional information on those methods).

### I-3.5.1.2 Special-Status Fish

Special-status fish are fish listed as threatened, endangered, or candidate species under the ESA of 1973, fish managed as "sensitive" by the BLM, and fish of special concern tracked by the Montana Natural Heritage Program. Fish of special concern are considered by the Montana Natural Heritage Program to be vulnerable to extirpation across their range or across the state due to rarity, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances. Section 3.7 of the main body of the EIS presents information about special-status fish that are potentially present in the vicinity of the proposed Project in Montana, including one federally protected fish, eight fish listed as conservation concerns by BLM and Montana, and BLM sensitive fish, which include some Montana fish species of concern. The three additional Montana fish of concern that are not discussed in the body of the EIS are addressed in this section: the blue sucker (*Cycleptus elongatus*), shortnose gar (*Lepisosteus platostomus*), and sicklefin chub (*Macrhybopsis meeki*). Information about the presence of those species and their state ranks is presented in Table I-3.5-2.

**TABLE I-3.5-2**
**Special-Status Fish Potentially Present in the Vicinity of the Proposed Project Route in Montana**

| Common and Scientific Names | Distribution and State Rank[1] | Habitat Associations |
|---|---|---|
| **Fish of Conservation Concern** | | |
| Blue Sucker (*Cycleptus elongatus*) | Present in the Missouri and Yellowstone rivers within the proposed Project area; S2S3. | Prefers swift current areas of large rivers, feeding on insects in cobble areas. |
| Shortnose gar (*Lepisosteus platostomus*) | Known only from Missouri River dredge cuts below Fort Peck Dam and a single specimen from the lower Yellowstone River; S1. | Large rivers, quiet pools, backwaters, and oxbow lakes. |
| Sicklefin chub (*Macrhybopsis meeki*) | Found in the Missouri River below Great Falls; S1. | Main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel. |

Sources: American Fisheries Society [AFS] 2009, BLM 2009, Brown 1971, Holton and Johnson 2003, MNHP 2009a, MNHP 2009b, MNHP and MFWP 2009.

[1] MNHP State Rankings (Rankings S1 through S3 are considered species of concern)
S1 – Critically imperiled
S2 – Imperiled because of rarity or factors that make it vulnerable to extinction
S3 – Rare, uncommon, or threatened, but not immediately imperiled

Blue suckers are present in the Missouri and Yellowstone rivers in Montana. They prefer swift current areas of large rivers with low turbidity, where they feed on insects in cobble areas (AFS 2009). Blue suckers migrate upriver in spring to congregate in fast, rocky areas for spawning. They often migrate up tributary streams (e.g., the Milk River) to spawn.

Shortnose gar are distributed throughout the Mississippi-Missouri River drainage. In Montana, this species is known to occur only in the Missouri River dredge cuts below Fort Peck Dam (Brown 1971), except for a single specimen found in the Yellowstone River approximately 15 miles upstream of the confluence with the Missouri River (AFS 2009, MNHP and MFWP 2009). The shortnose gar typically occurs in large rivers, quiet pools, backwaters, and oxbow lakes, and exhibits a tolerance for turbid water. Spawning occurs in May or June when adhesive eggs are deposited in small clumps attached to aquatic plants or other submerged objects in shallow water (Brown 1971). Eggs hatch eight to nine days after spawning.

The sicklefin chub is considered one of the rarest fish in Montana and is present in large, turbid streams in the plains region of Montana (MNHP 2009a). They are limited to the main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel. Their known distribution in Montana includes the Missouri River, above and below Fort Peck Lake, and the lower Yellowstone River, from the Intake Diversion Dam to the confluence with the Missouri River (AFS 2009). The species reaches a maximum age of four years and generally becomes sexually mature at the age of two years. Spawning occurs in main channel areas of large turbid rivers during the summer months (AFS 2009).

### I-3.5.2 POTENTIAL IMPACTS AND MITIGATION

#### I-3.5.2.1 Waterbodies

All proposed crossings of ephemeral and intermittent streams in Montana would use either conventional upland construction techniques if the streambed was dry or had non-moving water at the time of crossing, or an open-cut wet crossing (flowing, dry flume, or dam and pump). In general, flowing open-cut wet crossings would be used unless a specific stream was identified as potentially supporting sensitive aquatic species. Construction of crossings at dry ephemeral or dry intermittent stream beds would have no direct impact to fisheries or aquatic resources. When flows were returned to the streambeds, however, some increased turbidity would likely occur because of the disturbance to the banks and streambed. The returning water would pick up loose soil and fines, contributing to an increase in sediment load and downstream turbidity. Impacts to ephemeral and intermittent streams that were flowing and crossed using open-cut wet construction would be similar to impacts of open-cut wet crossings of perennial streams and would include direct mortality to fishery and aquatic resources, loss and alteration of habitat structure, changes in benthic communities, loss of riparian vegetation, and increased suspended sediment and sediment deposition.

Keystone would minimize construction-related effects to ephemeral and intermittent streams by implementation of the procedures identified in its CMR Plan (presented in Appendix B to the EIS) and implementation of the MDEQ Environmental Specifications (presented in Attachment 1 to this appendix). Impacts caused by the removal of riparian cover would be minimized by cutting vegetation at ground level, leaving the root systems intact to provide streambank stability. Removal of tree stumps would be limited to the area directly over the trench line. Construction across ephemeral and intermittent streams would generally be completed within a 24-hour period and streambanks would be stabilized with sediment barriers within 24 hours of completing the crossing. Riparian vegetation would be restored with native plants and conservation grasses, and if the streambed maintained wetland vegetation, wetland mitigation measures would be implemented. Project-related impacts and recommended mitigation measures for fisheries are presented in Section 3.7 of the EIS, and potential Project-related impacts to intermittent and ephemeral streams are discussed in Section 3.3 of the EIS and in Section I-3.1 of this appendix.

#### I-3.5.2.2 Special-Status Fish

The three Montana fish of concern addressed in this section (the blue sucker, sicklefin chub, and shortnose gar) are only associated with large rivers and streams that often have turbid or muddy water (AFS 2009, MNHP 2009a). The known distributions of these species in Montana are limited to the Missouri, Yellowstone, and Milk rivers. These rivers would be crossed using the HDD method, which would avoid direct disturbance to aquatic habitat and stream banks (see Section 2.3.4.5 of the EIS for additional information about the HDD method). This method of stream crossing would not directly affect these species if they were present in the rivers near the proposed crossing sites. There could be an inadvertent release of drilling lubricant into the aquatic environment if there was a break-through during the drilling operation that released these drilling fluids into the river. The drilling fluids would be non-toxic, but would contain bentonite. Bentonite is naturally occurring fine clay that could physically inhibit respiration of fishes and aquatic invertebrates, potentially resulting in suffocation. Exposure would likely be short term and limited in extent. Longer-term effects to fish populations could result from bentonite spills if larval fish were covered and suffocated from fouled gills and/or a lack of oxygen.

Disturbance to upland plant communities and environment could have direct impacts on aquatic habitats through increased sedimentation from wind and water erosion, and a reduction in filtering capacity and infiltration of runoff from reduced vegetative cover. While the effects of upland disturbance on aquatic habitat could be immediate, there could also be substantial response time lags for various components of the aquatic systems (Baxter et al. 1999). Most disturbances to vegetation from construction activities in uplands next to the Missouri, Yellowstone, and Milk rivers would be avoided by using HDD to cross these rivers.

Invasive aquatic species could be introduced into waterways and wetlands and spread by improperly cleaned vehicles and equipment operating in water, stream channels, or wetlands (Montana Aquatic Nuisance Species Technical Committee 2002). Introduced non-native plants and animals could degrade aquatic habitats, compete with native plants and animals, and transmit fish diseases (e.g., whirling disease) that could adversely impact fish of concern.

Withdrawal of hydrostatic test water in Montana is planned for the Missouri River (approximately 11.4 million gallons) and the Yellowstone River (approximately 11.6 million gallons). In addition, small withdrawals of water for HDD and miscellaneous uses are planned for the Missouri, Yellowstone, and Milk rivers. The MFWP has reserved instream flow water rights for some tributaries of these rivers (Table I-3.5-3). Keystone, as a junior user, would be required to ensure that the listed flow rate would be maintained in the stream while it was withdrawing water for hydrostatic testing.

**TABLE I-3.5-3**
**Montana Fish, Wildlife, and Parks Instream Water Reservations**

| Stream | Reach | Dates | Minimum Flows Cubic ft/sec | Minimum Flows Acre-ft/year | Total Volume for Period (acre-ft) |
|---|---|---|---|---|---|
| Frenchman Creek | International boundary to mouth | Jan., Feb., Mar., and Dec. | 2.0 | 2,900 | 480 |
| | | Apr. through Nov. | 5.0 | 2,900 | 2,420 |
| Rock Creek | International boundary to mouth | Jan., Feb., Mar., and Dec. | 2.0 | 4,352 | 480 |
| | | Apr. through Nov. | 8.0 | 4,352 | 3,872 |
| Missouri River #8 | Milk River to Montana state line | Year-round | 5,178 | 3,748,500 | 3,748,500 |
| Redwater River #1 | Circle to East Redwater Creek | Jan., Feb., Mar., and Dec. | 2.0 | 1,932 | 480 |
| | | Apr. through Nov. | 3.0 | 1,932 | 1,452 |
| Redwater River #2 | East Redwater Creek to mouth | Jan., Feb., Mar., and Dec. | 2.0 | 2,416 | 480 |
| | | Apr. through Nov. | 4.0 | 2,416 | 1,936 |
| Boxelder Creek | 1 mile west of Belltower to Montana state line | Jan., Feb., Mar., and Dec. | 4.0 | 4,348 | 960 |
| | | Apr. through Nov. | 7.0 | 4,348 | 3,388 |
| Little Beaver Creek | Russell Creek to Montana state line | Year-round | 3.0 | 2,171 | 2,171 |

During water withdrawal, eggs and small fish could become entrained. However, water withdrawal for hydrostatic testing in Montana would likely occur during the fall, avoiding potential impacts to fish eggs and larvae. Intake hoses would be screened to prevent the entrainment of fish or debris, and hose intakes would be kept at least 1 foot off of the river bottom. After use, the water would be discharged onto upland areas.

Contaminants could be introduced into aquatic systems through fluid leaks from equipment operation in or near water bodies or wetlands, or fuel spills during equipment refueling (impacts of accidental releases from the pipeline are addressed in Section 3.13 of the EIS). The release of toxic levels of oil, fuel, or other fluids could result in the loss of individual fish. Dilution of hazardous materials accidentally released in the aquatic environment would reduce the potential for lethal effects. Sublethal effects to fish from exposure to oil or petrochemicals could include reduced survival and productivity, reduced forage availability, and displacement.

Herbicides would be used to control vegetation before and after construction. The use of herbicides near a water body could affect aquatic organisms, including fish of concern. Herbicides could enter a water body through runoff, seepage through the soils, and direct introduction to water during application (e.g., wind drift).

Implementation of the procedures in Keystone's CMR Plan and in MDEQ's Environmental Specifications associated with HDD, water use, hydrostatic testing (see Section 3.7 of the EIS), and fuel handling would minimize the potential impacts to Montana fish of concern. HDD would prevent direct disturbance to larger river habitats and the sensitive fish that occupied those habitats (i.e., blue sucker, sicklefin chub, and shortnose gar). Water withdrawal for hydrostatic testing would likely occur during the fall and would not be likely to entrain fish eggs or larvae.

As a result, impacts to sensitive fish species in Montana would likely be temporary and minor.

### I-3.5.3 REFERENCES CITED

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## I-3.6 LAND USE, RECREATION, AND VISUAL RESOURCES

Section 3.9 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation for land use, recreation, and visual resources, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

### I-3.6.1 LAND USE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

#### I-3.6.1.1 Agriculture and Forest Land

The proposed route would cross approximately 94 miles of agricultural land in Montana. As shown in Table I-3.6-1, the majority of cropland crossed would be fallowed (87.9 percent). The remaining agricultural land crossed would be dryland (8.1 miles), flood irrigation (2.7 miles), and pivot irrigation (0.6 mile).

**TABLE I-3.6-1**
**Agricultural Land in Montana Crossed by the Proposed Project Route[1]**

| Cropland Irrigation Method | Miles of Cropland Crossed | Percentage of Total Agricultural Land Crossed (%) |
|---|---|---|
| Dryland | 8.1 | 8.6 |
| Pivot Irrigated | 0.6 | 0.6 |
| Sprinkler Irrigated | 0.0 | 0.0 |
| Flood Irrigated | 2.7 | 2.9 |
| Fallow | 82.6 | 87.9 |
| **Total** | **94.0** | **100.0** |

[1] Data from Keystone (2009) is based on surveys along the proposed route; data differ from tables that use MNHP databases for comparisons of cover types in Sections I-3.3 and I-3.4.

As described in Section 3.9.1.3 of the EIS, where construction would affect agricultural land, including irrigation systems and water supply lines, Keystone would negotiate the timing of construction and use of the existing irrigation equipment with the landowner to the extent practical. Agricultural land would be returned to pre-construction conditions to the extent practical, including repair and replacement of irrigation equipment, as stipulated in the Keystone CMR Plan (Appendix B) and in the MDEQ Environmental Specifications (Attachment 1).

In Montana, portions of the proposed route would cross small areas of upland forest land. As shown in Table I-3.6-2, the proposed route would cross a total of less than 1.2 miles of forest land, including 0.1 mile in Phillips County, 0.3 mile in Valley County, 0.3 mile in McCone County, 0.4 mile in Dawson County, and 0.1 mile in Fallon County.

| TABLE I-3.6-2<br>Forest Land Crossed by the Proposed Project Route in Montana[1] | | | | |
|---|---|---|---|---|
| **County** | **Milepost Begin** | **Milepost End** | **Miles of Forestland Crossed** | **Forest Type** |
| Phillips | 25.5 | 25.7 | 0.1 | Upland |
| Valley | 36.1 | 36.2 | 0.1 | Upland |
| Valley | 66.9 | 67.2 | 0.1 | Upland |
| Valley | 82.6 | 82.7 | 0.1 | Upland |
| McCone | 89.2 | 89.3 | 0.1 | Upland |
| McCone | 89.8 | 90.0 | 0.2 | Upland |
| Dawson | 158.9 | 159.0 | 0.1 | Upland |
| Dawson | 159.7 | 159.7 | 0.1 | Upland |
| Dawson | 177.3 | 177.3 | 0.1 | Upland |
| Dawson | 195.7 | 195.8 | 0.1 | Upland |
| Fallon | 229.5 | 229.6 | 0.1 | Upland |
| **Total** | | | **< 1.2** | |

[1] Data from Keystone (2009) is based on surveys along the proposed route; data differ from tables that use MNHP databases for comparisons of cover types in Sections I-3.3 and I-3.4.

### I-3.6.1.2 Developed Land: Residential, Commercial, and Industrial

In Montana, construction of the proposed Project would affect 44 acres of developed land and operation would affect 18 acres of developed land. The proposed route would extend across commercial land (0.1 mile), industrial land (0.1 mile), residential land9 (0.1 mile), other ROWs (3.3 miles of roadways, railroads, and utility corridors), and special use lands (less than 0.1 mile along a windbreak).

Keystone and MDEQ identified 17 structures in Montana within 25 feet of the construction ROW and 118 within 500 feet of the construction ROW (Table I-3.6-3). No residences would be located within 25 feet of the construction ROW. As discussed in Section 3.9.1.3 of the EIS and in the Keystone CMR Plan (Appendix B), site-specific construction plans would be developed for commercial/industrial buildings that were within 25 feet of the construction ROW, to avoid or minimize impacts to the structures and to minimize impacts to the users of those structures. Construction in those areas would be conducted in accordance with the requirements of the MDEQ Environmental Specifications (Attachment 1). Where groundwater wells were within 100 feet of a proposed facility, Keystone would construct the facilities in accordance with the requirements of the MDEQ Environmental Specifications to avoid or minimize impacts to the wells.

[9] Although the proposed route crosses residential land, there are no residences within 25 feet of the construction ROW (see Table I-3.9-3).

| TABLE I-3.6-3<br>Structures In the Vicinity of the Proposed Project Construction ROW in Montana | | |
|---|---|---|
| | **Number of Structures** | |
| **Structure Type** | **Within 25 feet of the Construction ROW** | **≤ 500 feet and > 25 feet from the Construction ROW** |
| Industrial | 2 | 1 |
| Groundwater well | 0 | 4 |
| Other | 3[1] | 41[2] |
| Outbuilding | 1 | 48 |
| Power Pole | 11 | 18 |
| Residence[3] | 0 | 6 |
| **Total** | **17** | **118** |

Sources: Keystone, 2009; Montana Basemap Service Center, 2010; and a January 2010 MDEQ field survey.

[1] Includes a cattle trough, a dam, and an unidentified structure.

[2] Includes a bridge, a cattle trough, a dam, a dam with a road, a gravel pit, underground pipe, a spring box, telephone/buried cable posts, troughs, a windmill, and several unidentified structures.

[3] Single residential structures are near MPs 5.7, 23.3, 70.3, and 71.0, and two residential structures are near MP 227.5.

A total of 155 individual residences and one small cluster of about 16 residences would be within approximately 1 mile of the ROW (Montana Basemap Service Center, 2010; U.S. Department of Agriculture, Farm Service Agency, 2005). The cluster of residences is located just south of Baker, near milepost 247.

## I-3.6.2 TRANSPORTATION AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

Roadways are divided into two categories: major roadways and minor roadways. Major roadways include highways with limited access, U.S. highways with unlimited access, and state and secondary highways. They serve large-scale transportation needs and are major connectors to municipal centers. Minor roadways are local roads and city streets. They serve smaller traffic volumes than major roadways and serve local transportation within the state.

### I-3.6.2.1 Roadways

Major roadways and railroads that would be crossed by the proposed route in Montana are listed in Table I-3.6-4. The proposed route would cross two U.S. highways, seven Montana state highways, one interstate highway, and six railroad ROWs. The proposed route would cross Montana State Highway 13, which BLM considers to be a scenic byway. The BNSF Railway would be the only railroad crossed by the proposed route.

The classifications of roadways and railroads crossed by the proposed route are listed in Table I-3.6-5. The majority of the roadways crossed would be local neighborhood, rural, and city roads. Keystone would cross all paved roads, primary gravel roads, highways, and railroads using conventional boring techniques, as described in its CMR Plan (Appendix B of the EIS). Therefore, there would be little or no impact to those roadways and railroads. Open cut construction would be used to cross most smaller, unpaved roads and driveways where permitted by local authorities or private owners.

To minimize the impacts to traffic during construction across roadways, Keystone would provide traffic control, including temporary detours where appropriate for crossings of smaller unpaved roads. Keystone consulted with the Montana Department of Transportation (MDT) about traffic control guidelines and program and policy analysis. MDT determined that the Manual on Uniform Traffic Control Devices is a suitable guide for traffic control.

**TABLE I-3.6-4**
**Major Roadways and Railroads Crossed by the Proposed Project Route in Montana**

| Road Name | Milepost |
|---|---|
| U.S. Highway 2 | 82.30 |
| U.S. Highway 12 | 244.50 |
| Montana State Highway 7 | 248.34 |
| Montana State Highway 247 | 269.03 |
| Montana State Highway 24 | 69.68 |
| Montana State Highway 200 | 146.87 |
| Montana State Highway 200S | 147.73 |
| Montana State Highway 13[1] | 145.98 |
| Montana State Highway 117 | 83.74 |
| Interstate Highway 94 | 193.04 |
| BNSF Railway | 82.40 |
| BNSF Railway | 147.77 |
| BNSF Railway | 154.18 |
| BNSF Railway | 163.23 |
| BNSF Railway | 196.01 |
| BNSF Railway | 243.92 |

[1] Classified as a Scenic Byway by BLM.

**TABLE I-3.6-5**
**Other Roadways and Railroads Crossed by the Proposed Project Route In Montana**

| Road Class | Number of Crossings | Percent of Total Crossings |
|---|---|---|
| Local neighborhood road, rural road, city | 98 | 81.7 |
| Private road for service vehicles (logging) | 7 | 5.8 |
| Railroad feature (main, spur, or yard) | 7 | 5.8 |
| Secondary road | 5 | 4.2 |
| Primary road | 2 | 1.7 |
| Scenic byway | 1 | 0.8 |
| **Total Crossings** | **120** | **100.0** |

On previous projects in Montana, MDEQ expressed concern about the ability of bridges, culverts, and cattle guards to accommodate the construction equipment and trucks hauling pipe and other heavy materials. As a result, MDEQ has recommended that prior to construction, Keystone consult with MDT to determine whether it would be appropriate to field check the road infrastructure (e.g., bridges, culverts, and cattle guards) to determine if the structures could accommodate the anticipated loads. For those structures determined to be unable to accommodate the loads, Keystone should develop a plan to avoid or reinforce those structures.

As a result of implementation of the procedures incorporated into the proposed Project to minimize impacts (including the Keystone CMR Plan, presented in Appendix B to the EIS, and the MDEQ Environmental Specifications, presented as Attachment 1 to this appendix), the proposed Project would not result in significant impacts to roadways and railroads in Montana. Potential impacts to traffic along the roadways during construction and operation are addressed in Sections 3.10.3.2 of the EIS.

#### I-3.6.2.2 Access Roads

Construction of the proposed Project would require a total of 50 access roads in Montana. Keystone would use existing roads for access roads to the extent practical, and all except three access roads would be temporary (i.e., used only during construction). The three permanent access roads would be used occasionally by maintenance and monitoring crews during operation of the proposed Project.

A total of 111.5 miles of access roads would be required in Montana, and 85.5 miles of those roads would be privately owned (Table I-3.6-6). The 50 access roads would affect approximately 265 acres of land, based on a 30-foot width. After construction, the newly constructed temporary access roads that would not be used during operation of the proposed Project would be restored to pre-construction conditions to the extent practical and in accordance with the Keystone CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1). Access roads crossing BLM land would require authorization under Title V of the Federal Land Policy and Management Act.

**TABLE I-3.6-6**
**Ownership of Access Roads Used for the Proposed Project in Montana**

| Ownership | Length of Access Roads (miles) | Percent of Ownership |
|---|---|---|
| Federal | 23.06 | 20.7 |
| State | 2.94 | 2.6 |
| Private | 85.50 | 76.7 |
| **Total** | **111.50** | **100.0** |

Keystone would limit construction traffic on existing and new access roads to the extent practical. The majority of the existing access roads proposed for the proposed Project are used for agriculture and/or livestock purposes. Most are dirt or gravel roads and are not maintained, and some roads might require improvements prior to their use for proposed Project construction. Each spread would require six to nine months to complete, including mobilization and demobilization, and a maximum of two spreads would be constructed simultaneously during a work season.[10] During operation, the access roads would occasionally be used by maintenance and monitoring crews.

Use of access roads during construction of the proposed Project could result in an occasional inconvenience to those currently using the roadways, as a result of the presence of construction vehicles and equipment; however, the impacts would be temporary and minor. Use of the access roads during construction and operation of the proposed Project would not result in significant adverse land use impacts.

### I-3.6.3 RECREATION RESOURCES AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

In Montana, the proposed route would not cross any state wildlife management areas, state parks, national primitive areas, national monuments, national recreation areas, national forests, or any rivers in reaches designated as wild and scenic. In addition, the proposed route does not cross any national natural landmarks, natural areas, researched natural areas, areas of critical environmental concern, research botanical areas, or outstanding natural areas. One special interest area, the Phillips County USFWS Wetland Easement, is crossed on the proposed route. No long-term effects are anticipated for this wetland easement. One Class I and one Class II fishery would be crossed by the proposed Project; however, both crossings would be constructed using the HDD method (see Section 2.0 of the EIS for construction methods), and therefore no impacts are anticipated.

Hunting and fishing along the proposed route could be temporarily disrupted in some locations during construction, but could resume as soon as construction was completed. Although the proposed route would cross the Lewis and Clark National Historic Trail at two locations, there would be no campsites or other recreational facilities within 2 miles of the proposed crossing site.

Disruptions to recreational activities and areas would be temporary and limited to areas within the construction ROW. After construction was completed, the ROW would be available for use where permitted by law and recreational activities would not be affected. Impacts to recreational visual quality are addressed below. Proposed transmission lines for Pump Stations 12 and 14 would not cross any recreation areas named above. Although 0.9 mile of State Trust land would be crossed by the proposed line for Pump Station 12 and 1.0 mile of State Trust land would be crossed by the proposed line for Pump Station 14, effects to any dispersed recreation activities that may occur there would be short-term and limited to construction.

### I-3.6.4 VISUAL RESOURCES

Visual resources are landscape characteristics that have an aesthetic value to residents and visitors from sensitive viewpoints such as residences, recreation areas, rivers, and highways. Characteristics include the aesthetics of natural and developed landscapes, and are considered an element of land use on federally managed lands. BLM is responsible for identifying and protecting scenic values on the public lands it manages. The Visual Resource Management (VRM) system was developed by BLM to assist in the identification and protection of scenic lands in a systematic and interdisciplinary manner.

The VRM system uses several aesthetic value classes to define the rehabilitation objective when landscapes are altered. The system classifies resources based on scenic quality, viewer sensitivity to

[10] Spread 4 begins in Baker, Montana, extends approximately 9 miles to the Montana/South Dakota border, and continues into South Dakota for approximately 63 miles.

visual change, and viewing distance. The system includes four visual inventory classes: Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of least value. BLM's objectives for each class are as follows:

- Class I: preserve the existing character of the landscape, including the natural ecological qualities. Some very limited management activity is permitted;
- Class II: preserve the existing character of the landscape and keep landscape changes at a minimum. Landscape changes should reflect the ambient colors, textures, and form of the surrounding features;
- Class III: keep landscape changes moderate and retain some portion of the existing character of the landscape. Management activities should not attract much attention or dominate the view. Landscape changes should reflect the basic features found in the landscape character; and
- Class IV: allow management activities that require major alterations in the existing character of the landscape. The view may be dominated by management activities. However, the location, disturbance, and blending with the surrounding landscape should be minimized.

BLM visual resource analysts for the Malta and Miles City Field Offices conducted the land inventories within their respective jurisdictions. Both offices recognize that even though BLM lands are intermingled among private lands along the proposed route, the quality of the landscape is not limited by ownership. As a result, the VRM classifications were applied to both public and private lands within the vicinity of the proposed Project in Montana. The Malta and Miles City Field Offices took slightly different approaches to the classification process for highways. The Miles City Field Office opted to classify a 2-mile-wide corridor for all interstate and U.S. highways as Class II and classified a 2-mile-wide corridor for all state and other highways as Class III. The Malta Field Office was not as specific. Therefore, the analysis presented below conforms to the Miles City Field Office approach.

The BLM VRM system incorporates a scenic quality rating system. Scenic quality is evaluated using adjacent scenery, color, cultural modifications, landforms, scarcity, vegetation, water, and the character of the surrounding landscape. Table I-3.6-7 presents descriptions of each of the three scenic quality classes within the VRM system.

**TABLE I-3.6-7**
**BLM VRM Scenic Quality Classification System**

| Class | Description |
|---|---|
| A | Scenery is distinctive with considerable variety in form, line, color, and texture. |
| B | Scenery is above average in relation to the surrounding area, has variety in form, line, color, and texture. |
| C | Scenery is considered common or typical throughout the region. |

### I-3.6.4.1 Affected Environment

Table I-3.6-8 lists the VRM classifications along the proposed route in Montana. The proposed route would not pass through areas designated as Class I. The proposed route would extend through seven areas designated as Class II, based on their unique qualities (approximately 14.2 percent of the proposed route in Montana). As indicated in Table I-3.6-8, approximately 71 percent of the area in the vicinity of the proposed route in Montana is rated as Class IV. Along those portions of the proposed route, the terrain would be generally flat or gently rolling and the vegetation would be mainly grassy rangeland. Between mileposts 102 and 116, the proposed route would extend through and around some barren badland areas. The proposed route would also cross three rivers with scenic quality classified as Class B: the Milk River, Missouri River, and Yellowstone River. The proposed 3.3-mile 115-kV transmission line for Pump Station 12 southeast of Circle would pass through areas rated as Class III and would parallel SH 200 for 3/4 mile. The proposed 5.2-mile 115-kV transmission line for Pump Station 14 would pass though areas rated as Class III and IV.Residential Viewpoints

Table I-3.6-9 lists the communities near the proposed pipeline route. The community nearest to the proposed route is Nashua, which would be about 1.5 miles (straight-line distance) from the proposed route. A total of 70 individual residences and one small cluster of about 16 residences would be located within 0.75 mile of the proposed route. The cluster of residences is just south of Baker (near milepost 247). Portions of the proposed Project could be observed from approximately 70 residences. At 33 of the residences, there would be some degree of vegetative screening between viewers and the proposed Project. The vegetative screens would vary from heavy, dense windbreaks to light residential landscaping. About 20 of the residences are within a BLM VRM Class II area.

**TABLE I-3.6-8**
**VRM Classifications in the Vicinity of the Proposed Project in Montana**

| Approximate Location | Starting Milepost | Ending Milepost | Length (miles) by VRM Class | | | |
|---|---|---|---|---|---|---|
| | | | Class II | Class III | Class IV | Total |
| Frenchman Creek | 0 | 11.99 | - | - | 11.99 | **11.99** |
| | 11.99 | 25.70 | 13.71 | - | - | **13.71** |
| | 25.70 | 35.11 | - | - | 9.41 | **9.41** |
| Rock Creek | 35.11 | 43.43 | 8.32 | - | - | **8.32** |
| | 43.43 | 68.18 | - | - | 24.75 | **24.75** |
| Montana State Highway 24 | 68.18 | 71.11 | - | 2.93 | - | **2.93** |
| | 71.11 | 78.93 | - | - | 7.82 | **7.82** |
| Old Smoky Road | 78.93 | 80.88 | - | 1.95 | - | **1.95** |
| U.S. Highway 2, BNSF/AMTRAK, Milk River | 80.88 | 84.10 | 3.22 | - | - | **3.22** |
| | 84.10 | 87.08 | - | - | 2.98 | **2.98** |
| Missouri River | 87.08 | 91.42 | 4.34 | - | - | **4.34** |
| | 91.42 | 92.99 | - | - | 1.57 | **1.57** |
| Parallel to Montana State Highway 24 | 92.92 | 103.35 | - | 10.36 | - | **10.36** |
| | 103.35 | 107.97 | - | - | 4.62 | **4.62** |
| Nickels Road | 107.97 | 109.97 | - | 2.00 | - | **2.00** |
| | 109.97 | 125.47 | - | - | 15.50 | **15.50** |
| East Fork Prairie Elk Creek | 125.47 | 128.98 | 3.51 | | - | **3.51** |
| | 128.98 | 145.03 | - | - | 16.05 | **16.05** |
| Montana State Highways 13, 200, and 200S | 145.03 | 162.01 | - | 16.98 | - | **16.98** |
| | 162.01 | 192.07 | - | - | 30.06 | **30.06** |
| Interstate Highway 94, Yellowstone River | 192.07 | 197.02 | 4.95 | - | - | **4.95** |
| | 197.02 | 203.21 | - | - | 6.19 | **6.19** |
| County Road 504 | 203.21 | 206.44 | - | 3.23 | - | **3.23** |
| | 206.44 | 206.78 | - | - | 0.34 | **0.34** |
| | 206.78 | 206.79 | - | 0.01 | - | **0.01** |
| | 206.79 | 243.64 | - | - | 36.85 | **36.85** |
| U.S. Highway 12 | 243.64 | 245.76 | 2.12 | - | - | **2.12** |

| TABLE I-3.6-8<br>VRM Classifications in the Vicinity of the Proposed Project in Montana | | | | | | |
|---|---|---|---|---|---|---|
| | | | Length (miles) by VRM Class | | | |
| Approximate Location | Starting Milepost | Ending Milepost | Class II | Class III | Class IV | Total |
| | 245.76 | 247.39 | - | - | 1.63 | **1.63** |
| Montana State Highway 7 | 247.39 | 249.77 | - | 2.38 | - | **2.38** |
| | 249.77 | 264.00 | - | - | 14.23 | **14.23** |
| County Road 7 Little Beaver Road | 264.00 | 266.00 | - | 2.00 | - | **2.00** |
| | 266.00 | 282.50 | - | - | 16.50 | **16.50** |
| **Totals** | | | **40.17** | **41.84** | **200.49** | **282.5** |
| **Percent of Total** | | | **14.2** | **14.8** | **71.0** | **100.0** |

| TABLE I-3.6-9<br>Communities Nearest the Proposed Project in Montana | |
|---|---|
| Community | Distance (miles) from Proposed Route[1] |
| Circle | 2.2 |
| Nashua | 1.5 |
| Baker | 2.1 |
| Glasgow | 5.8 |
| Glendive | 17.2 |

[1] Approximate straight-line distance.

### Recreation and Transportation Viewpoints

The proposed route would cross two sections of the Lewis and Clark National Historic Trail, one near the proposed pipeline crossing of the Missouri River and the second near the proposed crossing of the Yellowstone River. While the precise boundaries of the Lewis and Clark Trail are unknown, many visitors come to the area for the historic experience. The proposed route would be within 0.25 mile of the Charles M. Russell National Wildlife Refuge boundary. The proposed route would be more than 5 miles from any other identified recreation areas; the nearest such areas would be the Dredge Cuts Swimming Area, which would be about 5.5 miles from the proposed route, and the Downstream Campground at the base of Fort Peck Dam, which is about 6 miles from the proposed route.

As described above, the proposed route would cross several highways in Montana (see Table I-3.6-4), and travelers along those roadways would be able to observe portions of the proposed Project during construction and observe some aboveground proposed Project features during operation. Traffic volumes for those roadways are listed in Table I-3.6-10. In addition, the proposed route would be parallel to Montana State Highway 24 for several miles southeast of the Missouri River and parallel to Montana State Highway 200S for several miles southeast of Circle.

| TABLE I-3.6-10<br>Highway Viewpoints Crossed by the Proposed Project in Montana | |
|---|---|
| **Highway** | **Usage (vehicles per day)** |
| U.S. Highway 94 | More than 3,000 |
| U.S. Highway 2 | Approximately 1,500 |
| U.S. Highway 12 | Approximately 1,100 |
| Montana State Highway 24 | 200 to 800 |
| Montana State Highway 117 | 200 to 800 |
| Montana State Highway 13 | 200 to 800 |
| Montana State Highway 200 | 200 to 800 |
| Montana State Highway 200S | 200 to 800 |
| Montana State Highway 7 | 200 to 800 |

Other significant roadway viewpoints that would be crossed by the proposed route are listed in Table I-3.6-11. All of these smaller roads are lightly traveled, gravel surfaced, and do not have available traffic counts.

| TABLE I-3.6-11<br>Other Roadway Viewpoints with Potential Vistas of the Proposed Project in Montana | |
|---|---|
| **Road** | **Approximate Location** |
| Old Smoky Road | North of U.S. Highway 2 |
| Nickels Road | South of the Missouri River |
| County Road 504 | East of Fallon |
| County Road 247 | South of Baker |

The proposed route would also cross the BNSF Railway/AMTRAK railroad which carries a substantial number of business and recreational travelers who would have views of the proposed Project. The railroad line parallels the Missouri River and U.S. Highway 2.

### I-3.6.4.2 Potential Impacts and Mitigation

### Construction

Temporary impacts to visual resources would result from both construction activities and the presence of workers, equipment, and vehicles along the construction ROW. Visual impacts would result from clearing and removal of existing vegetation, exposure of bare soils, trenching, rock formation alteration, the presence of machinery and stored pipe, the presence of new aboveground structures, and in some locations, changes to the existing contours of the land. During the final stages of construction, backfilling and grading would restore the construction ROW to its approximate previous contours, and reclamation and revegetation would ultimately return the ROW to its approximate previous condition except in currently forested areas. In addition, vegetative buffers would be planted around the pump stations to reduce the visual impacts of the facilities.

Under MEPA and MFSA, MDEQ assesses potential visual impacts of proposed linear facilities. Keystone proposes to incorporate measures into the proposed Project that would minimize the visual effects of the proposed Project, as described in the CMR Plan (Appendix B of the EIS). Keystone would also comply with the MDEQ Environmental Specifications (presented as Attachment 1 to this appendix), which include measures to minimize visual impacts.

The visual impacts of construction would last only through the construction period; construction would last approximately six to nine months along each of the four construction spreads in Montana. Construction would likely be completed within about one month of initiation at any single location. Changes to visual resources during construction would be both temporary (e.g., trenching along the alignment) and permanent (e.g., construction of pump stations). Impacts from permanent changes are addressed below under the impacts of operation.

The majority of viewers of the proposed Project during construction would be travelers along the transportation corridors in the vicinity of the proposed Project. Their views would typically be limited to short periods of time and small portions of the ROW. Although recreational travelers would generally be more sensitive to changes in scenic quality, there would not be major recreation areas in the vicinity of the proposed route and few recreationists would be affected. Some individuals viewing the route from the 70 residences within 0.75 mile of the proposed ROW might be able to observe portions of the construction activities throughout the construction period.

Due to the small number of observers and the short construction period, the impact of construction of the proposed Project in Montana on visual resources would be temporary and would not be significant.

### Operation

Shortly after the completion of construction of the proposed Project in Montana, the ROW would be visible as a strong linear feature with some associated aboveground aspects that might adversely affect some viewers. However, previous pipeline projects indicate that after a period of one to five years, the proposed ROW would not be discernible in many areas, and in many other areas the adverse visual effects would be substantially reduced. Visual effects in agricultural areas would likely be eliminated with the first crop growth.

The Milk, Missouri, and Yellowstone rivers would be crossed using the HDD method to minimize impacts in the river and along adjacent areas. At the Milk River, the borehole would be located north of U.S. Highway 2 and the proposed pipeline would pass under the highway, the railroad, and river. As a result, there would be minimal adverse visual effects throughout this Class II area. Similarly, through the use of HDD, there would be minimal adverse visual effects for the steeper slopes of the Class II area along the Missouri River. The HDD-installed crossing of the Yellowstone River would extend from the flats north of the river, proceed under both the railroad and the river, and emerge on the plateau above the river to the south. The HDD method would likely be used to construct the pipeline crossing of U.S. Highway 94, which would be in a Class II area. Use of that construction method would minimize or avoid visual changes in the vicinity of the river during operation of the proposed Project.

The remaining Class II areas (i.e., Frenchman Creek, Rock Creek, East Fork Prairie Elk Creek, and U.S. Highway 12) would be crossed using the open-cut construction method. The visual effects in these areas would be similar to those of other open-cut segments of the proposed route. After revegetation and reclamation were completed (i.e., the vegetation has become established), the terrain and surface conditions would be similar to those of the surrounding areas. Although there would be observable changes in the landscape along some portions of the proposed ROW during operation, the objectives for all Class II areas (i.e., maintaining the existing character of the landscape and not attracting the attention of the casual observer) would likely be achieved.

The proposed Project would have six pump stations in Montana: four would be in BLM VRM Class IV areas (Pump Stations 9, 10, 13, and 14) and two in Class III areas (Pump Stations 11 and 12). All pump stations would be painted in colors that blended into the surrounding landscape and would have vegetative buffers installed to screen the facilities from viewers. Pump Station 11 would be located at milepost 97.9, which would be approximately 1 mile from State Highway 24, and would not be readily observable from the roadway. The pump station would also be located 9 miles south of the Missouri River and would not be observable from the river. Although the 115-kV transmission lines for Pump Stations 12 and 14 would add new linear features to the landscape, the lines would not be inconsistent with other transmission lines in the area. Objectives for Class III and IV areas would be achieved.

Pump Station 12 would be located at milepost 148.5, which would be approximately 2 miles southeast of the community of Circle and within 500 feet of State Highway 200S. Drivers and passengers using the highway and looking toward the pump station would observe a change in the landscape compared to current conditions, and some viewers might consider that an adverse impact. The intensity of the effect would be reduced by the vegetative buffer around the pump station.

The majority of viewers during proposed Project operation would be travelers along the transportation corridors in the vicinity of the proposed Project. Their views would typically be limited to short periods of time and small portions of the ROW. Although recreational travelers would generally be more sensitive to changes in scenic quality, there would not be major recreation areas in the vicinity of the proposed route and few recreationists that would be affected. Some individuals viewing the proposed Project from the 70 residences in the vicinity of the proposed ROW and from residences at the small cluster of residences located south of Baker might be able to observe portions of the proposed Project on a regular basis.

Where reclamation and revegetation would result in returning the proposed ROW to visual conditions either identical to or similar to existing conditions, there would be either no impact or only minor impacts to visual resources during operation. For portions of the proposed Project that would remain visually different from existing conditions during operation, the change to visual resources would be permanent (i.e., they would exist for the duration of the proposed Project). However, due to the small number of observers and the measures included in the proposed Project design to minimize the impacts to visual resources, the impact of operation of the proposed Project on visual resources in Montana would not be significant.

### I-3.6.5 REFERENCES CITED


Keystone. 2009. Keystone Montana Major Facility Siting Act Application, Supplemental Submittals, February and April.

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Montana Basemap Service Center. 2010. Montana Spatial Data Infrastructure, Structures Framework; accessed online at: http://giscoordination.mt.gov/structures/msdi.asp.

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## I-3.7 SOCIOECONOMICS

Section 3.10 of the main body of the EIS provides information on the affected environment and potential impacts of proposed Project implementation for socioeconomics, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

The assessment of potential socioeconomic impacts presented in this appendix includes information about communities in the vicinity of the proposed Project. However, it focuses on impacts at the county level rather than the community level for two primary reasons. First, due to the rural nature of the majority of the potentially affected environment, socioeconomic data used for comparisons are limited primarily to the county level. Secondly, economic impacts may occur in communities and rural areas that are not near the proposed route.

### I-3.7.1 AFFECTED ENVIRONMENT

#### I-3.7.1.1 Population

The proposed route would cross six counties in Montana including, from north to south, Phillips, Valley, McCone, Dawson, Prairie, and Fallon counties. Population-related characteristics of the counties and the state are summarized in Table I-3.7-1. As indicated in the table, the proposed route would extend through predominantly rural and sparsely populated areas, with population densities ranging from less than one to four people per square mile for the majority of the proposed route. Each of the counties had declining populations from 1990 to 2007.

**TABLE I-3.7-1**
**Population Characteristics Along the Proposed Route in Montana**

| County | Population | | | Annual Average Change in Population | Annual Average Change in Population | Population Density (per square mile) | Population Center |
|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | 2007 | 1990-2000 | 2000-2007 | 2000 | |
| Phillips | 5,163 | 4,601 | 3,934 | -1.1% | -2.2% | <1 | Malta |
| Valley | 8,239 | 7,675 | 6,884 | -0.7% | -1.5% | 2 | Glasgow |
| McCone | 2,276 | 1,977 | 1,716 | -1.4% | -2.0% | 1 | Circle |
| Dawson | 9,505 | 9,059 | 8,554 | -0.5% | -0.8% | 4 | Glendive |
| Prairie | 1,383 | 1,199 | 1,043 | -1.4% | -2.0% | <1 | Terry |
| Fallon | 3,103 | 2,811 | 2,690 | -9.4% | -4.3% | 2 | Baker |
| **Total** | **29,669** | **27.322** | **24,821** | **-7.9%** | **-9.2%** | | |

Sources: U.S. Census Bureau, 2000, 2007a, and no date.

Similar to county trends, the potentially affected communities along the proposed route have experienced an average annual reduction in population between 2000 and 2007. Potentially affected communities in this assessment are defined as those within a driving distance of approximately 3.0 miles from the proposed route. Table I-3.7-2 lists the populations of the communities within that distance.

| TABLE I-3.7-2<br>Communities Within 3.0 Miles of the Proposed Project in Montana | | | | |
|---|---|---|---|---|
| | | | Population | |
| **Community** | **County** | **Proximity to Project (miles)[1]** | **2000** | **2007** |
| Nashua | Valley | 1.8 | 325 | 291 |
| Circle | McCone | 2.8 | 644 | 558 |
| Baker | Fallon | 2.3 | 1,695 | 1,616 |
| **Total** | | | **2,664** | **2,465** |

Sources: U.S. Census Bureau 2000 and 2007a.
[1] Approximate driving distance.

### I-3.7.1.2 Housing

Table I-3.7-3 lists the existing short-term housing resources in the six counties along the proposed route. The availability of short-term accommodations varies throughout the year and depends on a number of factors, including seasonal fluctuations and timing of local events. However, previous vacancy rates can be used to compare potential vacancies with the proposed Project's housing needs during construction.

The total number of rental housing units was about 3,250 in 2000. Throughout the area near the proposed Project, the weighted average vacancy rate was 13.9 percent at that time. That would equate to a total of about 448 rental units at the present time, with most of the units in Dawson and Phillips counties. Table I-3.7-3 also lists the number of hotels/motels and campgrounds. The fewest number of hotel/motel rooms were in Prairie County (9) and McCone County (14).

| TABLE I-3.7-3<br>Housing in Counties Along the Proposed Project Route in Montana | | | | | | |
|---|---|---|---|---|---|---|
| **County** | **Total Housing Units (2000)** | **Number of Rental Housing Units (2000)** | **Rental Vacancy Rate (%) (2000)** | **Estimated Current Rental Vacancies** | **Number of Hotel/Motel Rooms** | **Number of Recreational Vehicle Sites** |
| Phillips | 2,502 | 632 | 14.1 | 89 | 135 | 52 |
| Valley | 4,847 | 826 | 7.9 | 65 | 503 | 79 |
| McCone | 1,087 | 240 | 25.8 | 62 | 14 | 0 |
| Dawson | 4,168 | 1,076 | 12.5 | 135 | 258 | 72 |
| Prairie | 718 | 143 | 15.4 | 22 | 9 | 18 |
| Fallon | 1,410 | 333 | 22.5 | 75 | 82 | 0 |
| **Total** | **14,732** | **3,250** | **13.9** | **448** | **1001** | **221** |

Sources: Keystone 2009a, which used the following primary data sources: Rentals = Census 2000; RV sites = Delorme Gazetteers; total hotel and motel rooms = www.travelpost.com/hotels.aspx, www.aaacolorado.com/travel/, www.tripadvisor.com/.

### I-3.7.1.3 Economic Activity

Using the most recent data available, Table I-3.7.4 lists the 2007 personal income and employment by industry in the six counties that would be crossed by the proposed route. The table lists only industries that had personal income equal to or greater than 5.0 percent of the respective county's total personal income, with the exception of farming. Major industries in the counties included government, transportation and warehousing, wholesale trade, health care and social assistance, and rail and transportation.

**TABLE I-3.7-4**
**Employment by Major Industry in Counties Crossed by the Proposed Route in Montana[1]**

| County | Industry | Number of Employees | Total Personal Income ($1,000) | Percent of County Total Personal Income |
|---|---|---|---|---|
| Phillips | Farm | 613 | 2,224 | 3.6 |
| | Government | 430 | 17,759 | 29.1 |
| | Health Care and Social Assistance | 213 | 5,126 | 8.4 |
| | Transportation and Warehousing | 107 | 4,939 | 8.1 |
| | Retail Trade | 229 | 4,406 | 7.2 |
| | Wholesale Trade | 113 | 3,995 | 6.6 |
| | Other Services | 187 | 3,920 | 6.4 |
| | Construction | 145 | 3,598 | 5.9 |
| | Finance and Insurance | 82 | 3,124 | 5.1 |
| | Other Categories | 568 | 11,844 | 5.1 |
| | *Non-Farm Subtotal* | *2,074* | *58,711* | *96.4* |
| | *County Total* | *2,687* | *60,935* | *100.0* |
| Valley | Farm | 826 | 6,455 | 4.9 |
| | Government | 762 | 35,426 | 27.1 |
| | Transportation and Warehousing | 168 | 13,242 | 10.1 |
| | Retail Trade | 459 | 9,371 | 7.2 |
| | Finance and Insurance | 186 | 7,186 | 5.5 |
| | Other Categories | 2,419 | 58,897 | 45.1 |
| | *Non-Farm Subtotal* | *3,994* | *124,122* | *95.1* |
| | *County Total* | *4,820* | *130,577* | *100.0* |
| McCone | Farm | 444 | 4,667 | 17.0 |
| | Government | 189 | 5,809 | 21.2 |
| | Wholesale Trade | 75 | 3,175 | 11.6 |
| | Construction | 50 | 1,513 | 5.5 |
| | Other Categories | 539 | 12,248 | 44.7 |
| | *Non-Farm Subtotal* | *853* | *22,745* | *83.0* |
| | *County Total* | *1,297* | *27,412* | *100.0* |
| Dawson | Farm | 581 | 9,622 | 3.7 |
| | Government | 792 | 32,948 | 18.4` |
| | Health Care and Social Assistance | 729 | 23,668 | 13.2 |
| | Rail Transportation | 68[1] | 27,591 | 15.4 |
| | Retail Trade | 661 | 13,102 | 7.3 |
| | Other Categories | 2,245 | 72,086 | 40.3 |
| | *Non-Farm Subtotal* | *5,108* | *169,395* | *94.6* |
| | *County Total* | *5,689* | *179,017* | *100.0* |
| Prairie | Farm | 221 | 3,517 | 22.4 |
| | Government | 175 | 6,998 | 44.6 |

| TABLE I-3.7-4<br>Employment by Major Industry in Counties Crossed by the Proposed Route in Montana[1] | | | | |
|---|---|---|---|---|
| **County** | **Industry** | **Number of Employees** | **Total Personal Income ($1,000)** | **Percent of County Total Personal Income** |
| | Other Categories | 277 | 5,170 | 33.0 |
| | *Non-Farm Subtotal* | *452* | *12,168* | *77.6* |
| | *County Total* | *673* | *12,168* | *100.0* |
| Fallon | Farm | 398 | 7,045 | 8.1 |
| | Mining | 250 - 499[2] | 18,039 | 20.7 |
| | Government | 283 | 11,288 | 13.0 |
| | Construction | 108[2] | 7,909 | 9.1 |
| | Transportation and Warehousing | 140 | 7,598 | 8.7 |
| | Health Care and Social Assistance | 158 | 4,711 | 5.4 |
| | Other Categories | 196 | 30,359 | 34.9 |
| | *Non-Farm Subtotal* | *1,842* | *79,904* | *91.9* |
| | *County Total* | *2,240* | *86,949* | *100.0* |

Source: U.S. Bureau of Economic Analysis 2009.

[1] Data presented only for industries with personal income equal to or greater than 5.0 percent of the respective county's total personal income.

[2] Data not available in U.S. Bureau of Economic Analysis 2009; data from U.S. Census Bureau 2009.

In 2007, there was a relatively wide range of total personal income among the six counties. In Dawson and Valley counties, the total personal incomes for that year were about $179 million and $131 million, respectively, and in McCone and Prairie counties they were about $27 million and $12 million, respectively.

Personal income generated from farming ranged from about 3.6 percent of the total personal income in Phillips County, to 22.4 percent of the total in Prairie County. Table I-3.7.5 lists the number of farms for each of the six counties for 2007 and 2002. The census definition of a farm is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. Valley County had 420 farms in 2007, up from the 336 in 2002. The county with the fewest farms was Prairie County, with 105. A comparison between the 2007 agricultural census data and the 2002 data shows that the number of farms in each county increased.

| TABLE I-3.7-5<br>Farm Income in Counties Crossed by the Proposed Project Route in Montana | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2007 | | | 2002 | | | Percent Change from 2002 | |
| County | Number of Farms | Gross Income ($1,000) | Percent of State Total | Number of Farms | Gross Income ($1,000) | Percent of State Total | Number of Farms | Gross Income |
| Phillips | 241 | 6,034 | 3.0 | 190 | 2,259 | 2.2 | 27 | 167 |
| Valley | 420 | 9,719 | 4.8 | 336 | 3,024 | 2.9 | 25 | 221 |
| McCone | 315 | 4,950 | 2.5 | 263 | 1,751 | 1.7 | 20 | 183 |
| Dawson | 295 | 2,641 | 1.3 | 263 | 1,810 | 1.7 | 12 | 46 |
| Prairie | 105 | 1,664 | 0.8 | 91 | 906 | 0.9 | 15 | 84 |
| Fallon | 165 | 1,538 | 0.8 | 140 | 658 | 0.6 | 18 | 134 |
| Montana | 11,344 | 201,752 | 100 | 9,968 | 103,574 | 100 | 14 | 95 |

Sources: U.S. Department of Agriculture 2002 and 2007.

Per capita income and median household income for each county crossed by the proposed route are listed in Table I-3.7-6, along with data for the state and the U.S. In most counties, the 2007 per capita income and the 2007 median household income were less than those of the state, and in every county the 2007 per capita income and median household income were less than the national levels.

Prairie County had the lowest median household income in 2007 with $32,857, which was $10,143 less than the state's median household income. Dawson County had the highest 2007 median household income with $43,678, which was $678 greater than the state's median household income.

| TABLE I-3.7-6<br>Per Capita Income for Counties Crossed by the Proposed Route in Montana | | | | | | |
|---|---|---|---|---|---|---|
| | Per Capita Income[1] ($) | | | Median Household Income[2] ($) | | |
| County | 2007 | 1999 | Difference Between County and State in 2007 | 2007 | 2004 | Difference Between County and State in 2007 |
| Phillips | 26,876 | 17,288 | -6,349 | 33,798 | 31,742 | -9,202 |
| Valley | 31,556 | 23,247 | -1,669 | 37,019 | 34,514 | -5,981 |
| McCone | 24,857 | 20,499 | -8,368 | 38,535 | 29,746 | -4,465 |
| Dawson | 29,268 | 20,307 | -3,957 | 43,678 | 35,740 | 678 |
| Prairie | 28,874 | 21,524 | -4,351 | 32,857 | 31,221 | -10,143 |
| Fallon | 35,405 | 20,281 | 2,180 | 42,408 | 37,822 | -592 |
| Montana | 33,225 | 21,585 | -5,390 | 43,000 | 35,574 | -7,740 |
| United States | 38,615 | 27,939 | NA | 50,740 | 44,334 | NA[3] |

[1] Sources: U.S. Bureau of Economic Analysis 1999 and 2007.
[2] Sources: U.S. Census Bureau 1999, 2004, and 2007b.
[3] NA = not available.

As noted above, the major industries in the six counties were government, transportation and warehousing, wholesale trade, health care and social assistance, and rail and transportation. In the general area (eastern Montana), there were approximately 20,180 semi-skilled labor jobs and 32,280 skilled labor jobs in 2008 (Ockert 2008). The median wage was $21,366 for semi-skilled labor and $36,587 for skilled labor.

Unemployment data for the six counties, the state, and the U.S. are listed in Table I-3.7-7. The October 2009 unemployment rate in each county was lower than the U.S. level for the same time period, and generally less than that of the state.

**TABLE I-3.7-7**
**Unemployment Rates for Counties Along the Proposed Route in Montana**

| | Rate (%) | | | Difference Between County and State in October 2009 (%) |
|---|---|---|---|---|
| **Location** | **October 2009[1]** | **2008** | **2002** | |
| Phillips | 4.9 | 4.5 | 4.5 | -1.0 |
| Valley | 4.7 | 3.8 | 4.1 | -1.2 |
| McCone | 3.1 | 2.6 | 2.7 | -2.8 |
| Dawson | 3.9 | 3.3 | 3.4 | -2.0 |
| Prairie | 3.0 | 3.8 | 5.1 | -2.9 |
| Fallon | 2.8 | 2.3 | 3.3 | -3.1 |
| Montana | 5.9 | 4.5 | 4.5 | - |
| United States | 10.2 | 5.8 | 5.8 | - |

Source: U.S. Bureau of Labor Statistics 2009.
[1] Preliminary.

### I-3.7.1.4 Tax Revenue

Table I-3.7-8 lists the 2007 property taxes levied by taxing entities in each county along the proposed route, the assessed value of property, and the implied effective tax rate. Effective property tax rates in the area of influence ranged from a low of 1.61 percent for the rural taxes assessed on property value in Fallon County to a high of 3.09 for the rural taxes assessed on property value in Dawson County. The average rate of the assessed rural taxes for the counties was 2.39 percent.

### I-3.7.1.5 Public Services

Table I-3.7-9 lists the key public services and facilities that serve the area within approximately 50 miles of the proposed route in each of the six counties. Each county has at least one medical facility.

There are multiple law enforcement service providers in the counties along the proposed route, including state patrols, county sheriff departments, local police departments, and special law enforcement agencies, such as university police. In many cases, mutual aid or cooperative agreements allow one agency to provide support to other agencies in emergencies. On average, two law enforcement agencies serve each county that would be crossed by the proposed Project. Valley County is served by four law enforcement agencies.

A network of fire departments and districts provides fire protection and suppression services across the region. Many of the fire districts across the region are staffed by volunteers and are housed in stations located in the larger communities.

Although it is unlikely that construction workers would bring school-aged children to the area during the construction period, schools are included in Table I-3.7-9.

Table I-3.7-10 provides the 2002 operations budgets for significant public services supplied by the municipalities potentially affected. In 2002, Glendive had the largest police, fire, highway, and solid waste management operations budgets. During that same year, Nashua had the smallest police, fire, and solid waste management operations budget and Terry had the smallest highway operations budget.

## I-3.7.2 POTENTIAL IMPACTS AND MITIGATION

### I-3.7.2.1 Overall Societal Benefits and Costs of the Project

The main benefit to society of the proposed Project would be the transport of crude oil from the WCSB to the U.S. to meet the growing demand by refineries and their markets in Petroleum Administration for Defense District (PADD) III. An additional benefit to society would be the transport of crude oil to some refineries in PADD II. Crude oil would be delivered primarily to existing delivery points near Nederland and Houston, Texas (PADD III), with some deliveries to the Cushing facility in Oklahoma (PADD II). Crude oil would be transported from these delivery points to various refineries. As described in Section 1.2 of the EIS, PADD III refineries are projected to have an increasing need for foreign oil, and would benefit from imports from relatively stable and secure nations such as Canada. This need is in part documented by the fact that at the time of issuance of the EIS, Keystone had binding contracts for approximately 380,000 bpd of WCSB crude oil, which would be more than half of the initial 700,000 bpd capacity of the proposed pipeline. The proposed Project would benefit residents of the United States, particularly those that obtained fuel from PADD III and PADD II refineries. In other words, the main benefits from this proposed Project would be regional and national rather than local to Montana.

As with any type of economic activity, building the proposed Project would produce a social opportunity cost to the economy, when compared to alternative uses of those same economic resources. The opportunity cost would be the next best use that could be made of the jobs, energy, and materials devoted to the proposed Project in the U.S. or world economy. Conceptually, the resources used to construct the proposed Project could be used to invest in energy efficiency, improve gas mileage efficiency to reduce crude oil consumption, build other projects such as buildings or bridges, or saved for later use. This opportunity cost would mainly be in the form of irretrievable materials, energy, worker hours, and capital used for the proposed Project. However, because the financial costs of the proposed Project would be provided by Keystone, it is not likely that the funds required for the proposed Project would be spent on any of the alternatives listed above.

The social opportunity cost of constructing and operating the proposed Project could also include alternative methods to meet the primary need that the proposed Project would meet (i.e., providing crude oil to PADD III refineries). Alternative ways to meet the need for additional oil transfer capacity might include expanding existing pipelines (this alternative is addressed in Section 4.0 of the EIS), using less oil overall, improvements in oil use efficiency, more domestic production close to PADD III, and developing alternatives to the use of oil as a fuel source. Any social benefits derived from implementation of these alternatives, instead of the proposed Project (including energy efficiency), would be an opportunity cost of the proposed Project. However, as described in Sections 1.2 and 4.0 of the EIS, the proposed Project is likely the only feasible alternative to meet the projected oil import needs of PADD III, and thus the opportunity cost in this case would likely be less than the social benefits of the proposed Project. In other words, energy efficiency and other alternatives would not be enough to meet the projected crude oil need in PADD III that the proposed Project is designed to serve.

**TABLE I-3.7-8**
**Assessed 2007 Tax Revenues and Assessed Property Valuation in Counties Crossed by the Proposed Project Route In Montana**

| | | Tax by Assessing Entity ($) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **County** | **Property Valuation ($)** | **State** | **County** | **Local Schools** | **Countywide Schools** | **Misc Fire Districts** | **Average City** | **SIDs[1] and Fees** | **Total All Taxes** | **Effective Tax Rate (%)** |
| Phillips | 321,173,215 | 1,454,022 | 1,072,155 | 2,348,783 | 388,631 | 101,757 | 280,298 | 1,428,280 | 7,073,926 | 2.20 |
| Valley | 485,988,933 | 2,288,509 | 2,616,238 | 4,256,067 | 1,109,805 | 393,838 | 824,998 | 1,917,211 | 13,406,666 | 2.76 |
| McCone | 191,888,122 | 617,586 | 1,330,050 | 956,802 | 243,504 | 16,778 | 136,958 | 28,409 | 3,330,087 | 1.74 |
| Dawson | 389,463,999 | 1,508,449 | 2,899,065 | 4,339,497 | 757,015 | 151,662 | 1,009,983 | 1,384,520 | 12,050,191 | 3.09 |
| Prairie | 94,403,567 | 332,198 | 760,371 | 427,445 | 118,587 | 14,598 | 76,641 | 468,104 | 2,197,944 | 2.33 |
| Fallon | 334,310,467 | 2,056,667 | 2,661,678 | 0 | 0 | 123,032 | 320,706 | 232,547 | 5,394,630 | 1.61 |
| **Total** | **1,817,228,303** | **8,257,431** | **11,339,557** | **12,328,594** | **2,617,542** | **801,665** | **2,649,584** | **5,459,071** | **43,453,444** | **2.39 (avg)** |

Source: Montana Department of Revenue 2009a.
[1] SIDs = Special Improvement Districts.

**TABLE I-3.7-9**
**Public Services and Facilities within 50 Miles of the Proposed Project in Montana**

| County | Police/Sheriff Departments[1] | Fire Departments[1] | Nearest Medical Facilities[2] | Schools[3] |
|---|---|---|---|---|
| Phillips | 1 | 2 | Phillips County Hospital (Malta) | 1 district with 5 elementary schools, 7 middle schools, and 4 high schools |
| Valley | 4 | 3 | Frances Mahon Deaconess Hospital (Glasgow) | 8 districts with 15 elementary schools, 18 middle schools, and 8 high schools |
| McCone | 2 | 1 | McCone County Health Center (Circle) | 1 district with 2 elementary schools, 2 middle schools, and 1 high school |
| Dawson | 2 | 4 | Glendive Medical Center (Glendive) | 1 district with 4 elementary schools, 4 middle schools, and 2 high schools |
| Prairie | 2 | 1 | Prairie Community Health Center (Terry) | 2 districts with 3 elementary schools, 3 middle schools, and 1 high school |
| Fallon | 2 | 2 | Fallon Medical Complex (Baker) | 1 district with 2 elementary schools, 3 middle schools, and 2 high schools |

[1] Source: Capital Impact 2008.
[2] Source: HomeTownLocator 2008.
[3] Source: Great Schools 2008.

**TABLE I-3.7-10**
**Operations Budgets for Public Services in the Communities Near the Proposed Project in Montana[1]**

| City/Town | Operations Budget ($) | | | | |
|---|---|---|---|---|---|
| | Police Protection | Fire Protection | Regular Highways | Solid Waste Management | Housing and Community Development[1] |
| Malta | 151,000 | 24,000 | 87,000 | 275,000 | 294,000 |
| Glasgow[2] | 587,000 | 51,000 | 538,000 | 228,000 | 14,000 |
| Nashua | 8,000 | 3,000 | 27,000 | 8,000 | NA |
| Circle | 80,000 | 4,000 | 28,000 | 74,000 | 64,000 |
| Glendive[2] | 704,000 | 280,000 | 406,000 | 764,000 | 28,000 |
| Terry | 40,000 | 6,000 | 22,000 | 91,000 | 240,000 |
| Baker | 168,000 | 28,000 | 120,000 | 159,000 | NA |

Source: City Data 2008.
[1] Data are for 2002, except where noted.
[2] 2006 Operations Budget.

There might be indirect national or regional (i.e., PADD III and II) benefits and costs from the proposed Project, including the effect on oil prices (likely to be insignificant) and any secondary effects on the oil market and crude oil transportation grid as a result of the new propose pipeline. Also, it is likely that obtaining additional oil from a stable and secure source would reduce the need to obtain oil from unfriendly or less stable sources and might reduce the overall costs of obtaining oil from unfriendly sources.
There could be local impacts if additional electrical distribution lines were built in Montana to provide electrical power to the pump stations.  These would likely be relatively small distribution lines with minimal economic impact from their construction.

Proposed Project construction might result in some social stresses on those who either opposed the proposed Project or who did not like change (e.g., the temporary presence of a large number of construction workers).  However, most social stresses that would occur would most likely fade or end when construction was completed.  In addition, as described in this appendix and in the EIS, costs from environmental damage and a lessening of recreational quality would be minimal.

The benefits and costs to Keystone would be private benefits and costs.  While this EIS is not concerned with private benefits and costs, it is useful to generally identify these benefits and costs.  Private benefits to Keystone would primarily consist of gross revenues earned from transporting crude oil for shippers. These revenues would accrue to Keystone and might be shared with its stockholders.  Gross revenues would translate into profits for Keystone if the proposed Project earned enough to offset its costs over time.  Profits could take the form of higher salaries, bonuses, and promotions for its employees.  Profits might also increase the ability of Keystone to expand or invest in other projects, and/or be used to provide a higher return for shareholders.  It might take several years for the proposed Project to be profitable, as revenues increased, costs were recovered, and interest costs on financing decreased.  Profits could last for the life of the proposed Project.

The main private costs of the proposed Project would be borne by Keystone and include construction; operation and maintenance; local, state and federal taxes; implementing environmental mitigation measures; financing (debt payments); permitting; landowner payments; contingencies; and any fines that might be imposed.  If such costs were too great, if proposed Project revenues were not sufficiently high, or if the proposed Project was not constructed, net losses could accrue to Keystone and to the shareholders, either in the short term (e.g., the proposed Project was not constructed and Keystone had to absorb the costs incurred to date) or in the long term (e.g., the proposed Project was constructed and operated, but operated at a net loss for many years).

The secondary benefits and costs to those who live in proximity to the proposed Project (e.g., personal income from working on the proposed Project, tax revenues to a local taxing district, and inconvenience during construction) are discussed below.

### I-3.7.2.2 Construction

#### Construction Workforce and Work Camps

Construction of the proposed Project pipeline would occur in four construction spreads in Montana (Table I-3.7-11).  Each spread would require six to nine months to complete, including mobilization and demobilization.  The proposed Project would require construction of six pump stations in Montana, with each pump station anticipated to be constructed in 18 to 24 months.  A maximum of two spreads would be constructed simultaneously during a work season.  Construction of the proposed Project would begin as soon as Keystone obtained all necessary permits, approvals, and authorizations.  Based on the current permitting schedule, the proposed Project would be placed into service in 2013.

| TABLE I-3.7-11<br>Pipeline Construction Spreads for the Proposed Project in Montana | | | | |
|---|---|---|---|---|
| **Spread Number** | **Approximate Location** | **Approximate Length (miles)** | **County** | **Community Base for Construction** |
| Spread 1 | MP 0 to 64 | 64 | Phillips and Valley | Hinsdale and Glasgow |
| Spread 2 | MP 64 to 164 | 100 | McCone and Dawson | Glasgow and Circle |
| Spread 3 | MP 164 to 273 | 109 | Dawson, Prairie, and Fallon | Glendive and Baker |
| Spread 4[1] | MP 273 to 282 | 9 | Fallon | Buffalo, South Dakota |

[1] Spread 4 would begin in Baker, Montana, extend approximately 9 miles to the Montana/South Dakota border, and would continue into South Dakota for approximately 63 miles.

[2] The worker base for construction of Spread 4 would be in South Dakota.

Keystone anticipates a maximum construction workforce of 500 to 600 personnel for each spread and 20 to 30 for each pump station (see Table I-3.7-12). Pump stations would not be constructed concurrently and the workers might be assigned to more than one pump station. However, the assessments below consider the maximum work force that would involve a separate workforce for each pump station.

Keystone would attempt to hire local construction workers to the extent practical. If a sufficient number of qualified workers were available, Keystone estimates that approximately 10 to 15 percent of the workforce might be hired from the local pool of construction workers for each pipeline spread (about 50 to 100 workers per spread) and each pump station (about two to four workers per spread). However, there might not be a sufficient number of workers available in some areas of Montana to achieve this goal.

| TABLE I-3.7-12<br>Estimated Number of Construction Workforce for the Proposed Project in Montana | | | | | |
|---|---|---|---|---|---|
| | **Number of Workers per Facility** | | **Number of Facilities[1]** | **Total Construction Workforce[1]** | |
| **Facility** | **Low** | **High** | | **Low** | **High** |
| Spread | 500 | 600 | 4 | 2,000 | 2,400 |
| Pump Station | 20 | 30 | 6 | 120 | 180 |
| **Cumulative Total** | **520** | **630** | **10** | **2,120** | **2,580** |

[1] Only two of the four spreads in Montana would be under construction concurrently. Construction workers on Spread 4 would be housed in South Dakota. The peak pipeline workforce to be housed in the Montana work camps would be up to 1,200 during either of the two work seasons. The total workforce listed in this table is the cumulative total over two work seasons.

Keystone recognizes that the rural areas in Montana along the proposed route would not have sufficient temporary housing to accommodate the planned construction workforce. As a result, Keystone would install temporary work camps to provide accommodations for workers during construction of the proposed pipeline (as further described in Section 2.2.7.4 of the EIS). There would be two camps in Montana, one near Nashua and the other near Baker, to accommodate workers from Spreads 1, 2, and 3. Workers from Spread 4 would be housed in South Dakota. As noted above, no more than two spreads would be under construction during each of the two work seasons. Pump station workers would not be housed in the work camps.

Each construction camp site would be established on approximately 80 acres of land, of which 30 acres would be used as a contractor yard and 50 acres for housing and administration. The camps would be designed to provide accommodations for approximately 600 people each and would include prefabricated, modular dormitory-style units with heating and air conditioning systems. The camps would provide sleeping areas with shared and private wash rooms, recreation facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, security units, and an infirmary unit.

Potable water would be provided by drilling a well, where feasible. If an adequate water supply could not be obtained from a well, water would be obtained from municipal sources or trucked to each camp. A wastewater treatment facility would be constructed for each camp. Electricity for the camps would either be generated on site through diesel-fired generators or provided by local utilities from interconnections to distribution systems.

### Population

During construction, there would be a temporary increase in population in each county along the proposed route from the presence of construction workers. Population impacts in the region of influence would depend on the composition of the local and non-local construction workforces and the existing population in the area. Keystone would use local construction workers where possible, with an estimated 10 to 15 percent of the total construction workforce possibly hired from local communities. Local workers could leave their existing jobs for higher-paying Project-related construction jobs, but that effect would likely be insignificant in the long term. Few non-local workers would likely be accompanied by their children or other family members because of the mobile nature of the workforce along the proposed pipeline route during construction.

As described above, pipeline workers in Montana would be housed in work camps established by Keystone. This would reduce the effect of the temporary population increase on residents of the rural areas. As noted above, a maximum of two spreads would be constructed simultaneously and, therefore, the 1,200-person total capacity of the two work camps in Montana would be sufficient to accommodate all of the pipeline construction workers for each work season.

With use of the work camps for the majority of the construction workforce in Montana, the temporary population increase would result in a minor and temporary impact on the social structure of the area in the proposed Project vicinity. However, work camps would be in the vicinity of Baker and Nashua, and after work hours a portion of the pipeline workers would likely occasionally leave the camps. Similarly, pump station construction workers using local housing would be a part of the local population during non-working hours for the duration of the construction period of each work season. This could result in occasional temporary minor to moderate impacts in Baker and Nashua and in the vicinity of the pump stations, primarily in the form of social stresses and an increased demand on local public services. Those impacts would end after construction was completed.

### Housing

Assuming that 10 to 15 percent of the workforce would be local construction workers, approximately 440 to 570 housing units would be required for workers on each construction spread, assuming that each worker would require his or her own unit. However, it is unlikely that a sufficient number of temporary housing units would be available, even if some workers lived in their own campers or motor homes. Therefore, as described above, to accommodate most of the construction workers in Montana, Keystone would establish two construction work camps in the area. Because a maximum of two spreads would be constructed simultaneously, the 1,200-person total capacity for the two work camps in Montana would be sufficient to accommodate all of the pipeline construction workers for each work season.

Workers associated with the pump stations would not be housed in the work camps. Use of temporary housing in the vicinity of the pump stations might result in a temporary, minor impact to other potential users of temporary housing during each work season (e.g., tourists and anglers). However, the owners of the temporary housing would experience a positive impact if the housing would have otherwise remained vacant during construction.

Although there would be some temporary housing units rented by workers, use of the camps by the majority of workers would avoid using all of the available temporary housing and allow normal use of those housing units. As a result, there might be a minor, temporary impact on temporary housing in the vicinity of the proposed route from construction of the proposed Project.

### Public Services

The influx of construction workers in local communities also would have the potential to generate additional demands on local public services. The magnitude of public service impacts would vary by community, depending on the size of the non-local workforce and their accompanying families, the size of the community, and the duration of their stay. However, few non-local workers would likely be accompanied by family members because of the short construction period and transient nature of the work. With a relatively large construction workforce temporarily in the area, the primary increases in public service needs would include responses to emergencies and disturbances during construction. However, at least the majority of the construction workforce would be housed in the work camps where there would be medical care facilities and security staff to respond to emergencies and disturbances. The camps would also include water supplies and sanitary waste treatment facilities. As a result, construction impacts to existing public services in the vicinity of the proposed Project, including the towns of Baker and Nashua, would be minor and temporary.

### Local Economies

The proposed Project would generate direct and indirect economic benefits for local and regional economies along the proposed pipeline route. During construction, these benefits would be derived from wages earned by local construction workers that were above the wages that might otherwise have been earned at other jobs by those workers, from construction-related expenditures made at local businesses, construction worker spending in the local economy that would not have occurred without the proposed Project, and taxes on both wages and expenditures that would go to local and state governments. Overall, construction of the proposed Project in Montana would result in a positive economic impact to the businesses and taxing jurisdictions in counties along the proposed route and in some of the communities near the route.

Construction through active cropland would result in the loss of income from at least a portion of the crop for at least one growing season. It might also affect income and land value in the long term along the proposed ROW, as well as the ability of the landowner to sell the property. However, Keystone stated it would compensate farmers for crop losses, reclaim the land in the construction ROW to match pre-construction conditions to allow farming to continue, and provide payments for easements along the proposed route. As a result, the impact of the proposed Project on farm income would be temporary. The significance of the impact to each landowner would depend on the terms of payment agreed to between the landowner and Keystone.

During operation, the pump stations would consume at least as much electrical power as other customers currently use in the area. That could result in long-term stability of the usage rates of electricity and increased profits to local electric co-ops. It might also result in issues for local co-ops regarding procurement of additional energy supplies.

### I-3.7.2.3 Operation

#### Population, Housing, and Public Services

Operation of the proposed Project would require approximately four to eight permanent employees in Montana. Even assuming that none of those workers would be local residents, that number of new residents would not have an adverse effect on local populations, housing, or public services in the counties along the proposed route in Montana or in the nearby communities.

#### Local Economies

During operation, activities associated with maintenance, monitoring, and repair of the proposed Project would generate a demand for goods and services, including electrical power, that would result in long-term economic benefits to the region. The beneficial impact would likely be minor in comparison to the overall economies of the counties and the communities near the proposed Project.

#### Tax Revenue and Fiscal Resources

Once constructed, the proposed Project would generate long-term property tax revenues for the counties traversed by the pipeline that would last for the life of the proposed Project. The increase in tax revenue was estimated by staff at the Montana Department of Revenue (MDR 2009a and b). Table I-3.7-13 lists the estimated property taxes by taxing district within each county. Based on those estimates, the proposed Project would generate approximately $63 million in annual property tax revenues in Montana, or about 46 percent more in property taxes than was generated in 2007 in those same counties. About $47 million of that amount would be paid to McCone, Valley, and Dawson counties.

In estimating the property taxes, the MDR applied the existing tax rate (12.0 percent) for Class 9 properties (Utilities Mileage, Pipelines Mileage) to the estimated capital cost of the proposed pipeline in Montana. The property taxes generated by the proposed Project would have a long-term positive economic impact on the counties. The magnitude of the impact would vary from county to county and would range from minor to major.

Some tax revenue would also be generated for the state general fund and the federal government. If the proposed Project received lower tax rates than estimated in Table I-3.7-13, the revenues would also be lower than the estimates presented in the table. There would be relatively minor costs to state agencies for monitoring the proposed Project during construction and operation. These costs would likely be offset by fees collected from Keystone.

**TABLE I-3.7-13**
**Estimated Taxes by Special Districts in Counties Along the Proposed Project Route in Montana**

| County | Portion of Total Length of Project Pipeline in County (%) | Market Value (Capital Cost of Project) | Class 9 Tax Rate (%) | Taxable Value | Average Rural Mills | Estimated Total Taxes | 95-Mill Statewide School Equalization Tax | 6-Mill Statewide University System Tax | Total Local Taxes |
|---|---|---|---|---|---|---|---|---|---|
| Phillips | 1.88 | $130,941,355 | 12 | $15,712,963 | 378.93 | $5,954,069 | $1,492,731 | $94,278 | $4,367,060 |
| Valley | 4.60 | $320,388,422 | 12 | $38,446,611 | 487.53 | $18,743,712 | $3,652,428 | $230,680 | $14,860,604 |
| McCone | 4.89 | $340,586,823 | 12 | $40,870,419 | 542.36 | $22,166,302 | $3,882,690 | $245,223 | $18,038,389 |
| Dawson | 2.96 | $206,162,985 | 12 | $24,739,558 | 671.99 | $16,624,844 | $2,350,258 | $148,437 | $14,126,149 |
| Prairie | 1.55 | $107,956,968 | 12 | $12,954,836 | 554.08 | $7,178,068 | $1,230,709 | $77,729 | $5,869,630 |
| Fallon | 4.68 | $325,960,395 | 12 | $39,115,247 | 246.62 | $9,646,602 | $3,715,948 | $234,691 | $5,695,963 |
| **Total** | **20.56** | **$1,431,996,948** | | **$171,839,634** | | **$80,313,597** | **$16,324,764** | **$1,031,038** | **$62,957,795** |

Source: Montana Department of Revenue 2009b.

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## I-3.8 AIR QUALITY AND NOISE

Section 3.12 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation for air quality and noise, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

### I-3.8.1 AIR QUALITY

The Clean Air Act (CAA) and its implementing regulations (42 USC 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. The requirements applicable to the proposed Project in Montana are described in detail in Section 3.12.1.2 of the EIS.

#### I-3.8.1.1 Affected Environment

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The existing climate and ambient air quality in the vicinity of the proposed Project in Montana are described below.

**Montana Climate**

Montana is in the humid continental climate zone, an area noted for its variable weather patterns and large temperature ranges. Summer high temperatures average over 89 ˚F, while winter low temperatures average 12 to 20 ˚F. Many different types of air masses occur over the state, principally polar and tropical air masses. Where polar air masses collide with tropical air masses, there is an uplift of the less dense and moister tropical air that results in precipitation. Representative climate data for Circle, which is about 2.2 miles from the proposed route, are presented in Table 3.12.1-1 of the EIS.

**Ambient Air Quality**

Ambient air quality is regulated by federal, state, and local agencies. State air quality standards cannot be less stringent than the national ambient air quality standards (NAAQS). The Montana ambient air quality standards (MAAQS) and the NAAQS are listed in Table I-3.8-1.

The U.S. Environmental Protection Agency (EPA) uses four categories to classify the air quality of all areas of the United States: attainment, unclassifiable, maintenance, or nonattainment. The proposed Project would not pass through any nonattainment areas in Montana.

EPA and state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the country, and to assist in the designation of nonattainment areas. To characterize the background air quality in Montana, data from air quality monitoring stations were obtained. A summary of the available regional background air quality concentrations for 2008 is presented in Table 3.12.1-3 of the EIS.

**TABLE I-3.8-1**
**National and Montana Ambient Air Quality Standards**

| Pollutant | Time Period | Federal (NAAQS) | Montana (MAAQS) | Standard Type |
|---|---|---|---|---|
| Carbon Monoxide | Hourly Average<br>8-Hour Average | 35 ppm[a]<br>9 ppm[a] | 23 ppm[b]<br>9 ppm[b] | Primary<br>Primary |
| Fluoride in Forage | Monthly Average<br>Grazing Season | - -<br>- - | 50 µg/g[c]<br>35 µg/g[c] | - -<br>- - |
| Hydrogen Sulfide | Hourly Average | - - | 0.05 ppm[b] | - - |
| Lead | 90-Day Average<br>Quarterly Average<br>Rolling 3-Month Average | - -<br>1.5 µg/$m^3$<br>0.15 µg/$m^3$ [c] | 1.5 µg/$m^3$ [c]<br>- -<br>-- | - -<br>Primary & Secondary<br>Primary & Secondary |
| Nitrogen Dioxide | Hourly Average<br>Annual Average | 0.100 ppm[d]<br>0.053 ppm[e] | 0.30 ppm[b]<br>0.05 ppm[f] | Primary<br>Primary & Secondary |
| Ozone | Hourly Average<br>8-Hour Average | 0.12 ppm[g]<br>0.075 ppm[h] | 0.10 ppm[b]<br>- - | Primary & Secondary<br>Primary & Secondary |
| Particulate matter less than 10 microns in diameter | 24-Hour Average<br>Annual Average | 150 µg/$m^3$ [i]<br>- - | 150 µg/$m^3$ [j]<br>50 µg/$m^3$ [k] | Primary & Secondary<br>Primary & Secondary |
| Particulate matter less than 2.5 microns in diameter | 24-Hour Average<br>Annual Average | 35 µg/$m^3$ [l]<br>15 µg/$m^3$ [m] | - -<br>- - | Primary & Secondary<br>Primary & Secondary |
| Settleable Particulate | 30-Day Average | - - | 10 g/$m^2$ [c] | - - |
| Sulfur Dioxide | Hourly Average<br>3-Hour Average<br>24-Hour Average<br>Annual Average | - -<br>0.50 ppm[a]<br>0.14 ppm[a]<br>0.030 ppm[e] | 0.50 ppm[i]<br>- -<br>0.10 ppm[b]<br>0.02 ppm[f] | - -<br>Secondary<br>Primary<br>Primary |
| Visibility | Annual Average | - - | 3 x 10 -5/m[f] | - - |

Sources: U.S. Environmental Protection Agency 2009 and Montana Department of Environmental Quality 2009.

Notes:

Mg = Microgram(s).

$m^3$ = Cubic meter(s).

ppm = Part(s) per million.

[a] Federal violation when exceeded more than once per calendar year.

[b] State violation when exceeded more than once over any 12 consecutive months.

[c] Not to be exceeded (ever) for the averaging time period as described in state or federal regulation.

[d] Federal violation when the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area that exceeds 0.100 ppm (effective January 22, 2010).

[e] Federal violation when the annual arithmetic mean concentration for a calendar year exceeds the standard.

[f] State violation when the arithmetic average over any four consecutive quarters exceeds the standard.

[g] Applies only to nonattainment areas designated before the 8-hour standard was approved in July, 1997; Montana has none.

[h] Federal violation when 3-year average of the annual 4th-highest daily maximum 8-hour concentration exceeds standard.

[i] State violation when exceeded more than eighteen times in any 12 consecutive months.

[j] State and federal violation when more than one expected exceedance per calendar year, averaged over 3-years.

[k] State violation when the 3-year average of the arithmetic means over a calendar year at each monitoring site exceed the standard.

[l] Federal violation when 3-year average of the 98th percentile values at each monitoring site exceed the standard.

[m] Federal violation when 3-year average of the annual mean at each monitoring site exceeds the standard.

### I-3.8.1.2 Potential Impacts and Mitigation

Two types of impacts on air quality were considered for this analysis:

- Temporary impacts resulting from emissions associated with construction activities; and
- Long-term or permanent (i.e., lasting the life of the proposed Project) impacts resulting from emissions generated from operation of a stationary source.

#### Construction

As noted in the Section 3.12.1.3 of the EIS, air quality impacts associated with construction of the proposed Project would include emissions from fugitive dust, fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks. Because pipeline construction would move through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies and in accordance with the procedures in the Keystone CMR Plan (presented in Appendix B of the EIS) and the MDEQ Environmental Specifications (presented as Attachment 1 to this appendix). In addition, Keystone would establish work camps in Montana to house construction workers and to provide key services to the workers. The camps might require preconstruction permitting unless exemptions existed and were met for temporary nonroad engines. By complying with applicable regulations and implementing the procedures in the CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1), emissions from construction-related activities would not significantly affect local or regional air quality. Construction of the proposed Project would have a minor, short-term adverse impact on the air quality in the area.

#### Operation

As noted in the Section 3.12.1.3 of the EIS, air quality impacts associated with operation of the proposed Project would include minimal fugitive emissions from crude oil pipeline connections and pumping equipment at the pump stations, and minimal emissions from mobile sources using fossil fuel. Keystone would comply with applicable regulations that would address emissions during operation. As a result, emissions from operation of the proposed Project would not significantly affect local or regional air quality. The impact on air quality would be minor and would last for the life of the proposed Project.

## I-3.8.2 NOISE

The noise requirements applicable to the proposed Project in Montana are described in Section 3.12.2.2 of the EIS.

### I-3.8.2.1 Affected Environment

The proposed Project would be constructed in primarily rural agricultural areas of Montana. It is estimated that the existing sound level in the vicinity of the proposed route ranges from 40 dBA (rural residential) to 45 dBA (agricultural cropland). Sound in the area is generated by roadway traffic, farm machinery on a seasonal basis, pets, and various household noises. EPA (1978) reported that areas along major highways and interstates might have higher ambient sound levels, ranging from approximately 68 to 80 dBA.

In Montana, there no residences would be within 25 feet of the proposed ROW and only six residences would be within 500 feet of the ROW (Keystone 2009). Based on Keystone (2009) and data in the Montana Basemap Service Center (2010), there no residences would be within 0.5 mile of the pump stations, and four residences and one commercial structure would be more than 0.5 mile and less than 1 mile from the pump stations. Prior to construction, Keystone would verify the proximity of structures to the pump stations and determine whether they were occupied by residences or businesses.

### I-3.8.2.2 Potential Impacts and Mitigation

Noise impacts for the proposed Project would generally fall into two categories:

- Temporary impacts resulting from construction activities (e.g., operation of construction equipment); and
- Long-term or permanent impacts (i.e., lasting the life of the proposed Project) resulting from operation of proposed Project facilities.

#### Construction

As noted in Section 3.12.2.3 of the EIS, construction of the proposed Project would be similar to other pipeline system projects in terms of schedule, equipment used, and types of activities. Construction would increase sound levels in the vicinity of proposed Project activities, and the sound levels would vary during the construction period, depending on the construction phase. Construction sound levels would rarely be steady, but instead would fluctuate depending on the number and types of equipment in use at any given time. Construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance. Residential, agricultural, and commercial areas within 500 feet of the construction ROW would experience short-term inconvenience from the construction equipment noise. Keystone would implement the applicable procedures in its CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1) to minimize the effects of construction noise on individuals, sensitive areas, and livestock. As a result, construction of the proposed Project would have a minor and temporary impact on sound levels in the vicinity of the construction ROW.

#### Operation

As described in Section 3.12.2.3 of the EIS, operation of the electrically driven pump stations would result in an increase in sound levels. However, this increase would be limited to the area in close proximity to the pump stations. Sound levels would likely attenuate nearly to existing ambient levels (40 to 45 dBA) within about 2,300 feet of each pump station, and no structures would be within 0.5 mile (2,640 feet) of the pump stations. Although noise impacts from the electrically powered pump stations would likely be minor, Keystone would perform a noise assessment survey during operation in locations where residents expressed concerns about pump station noise. Those surveys would indicate the sound levels at that residence and would be used to determine what noise abatement measures would be required to reduce the sound levels at that residence. Mitigation measures could include construction of berms around the pump station or planting vegetation screens.

As a result, operation of the proposed Project would not result in a significant increase in sound levels. The impact on sound levels would be minor and would last for the life of the proposed Project.

### I-3.8.3 REFERENCES CITED


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## I-4.0 UNAVOIDABLE ADVERSE IMPACTS

The proposed Project would incorporate various types of measures to avoid or reduce environmental impacts, including the following:

- Measures committed to by Keystone in its CMR Plan (Appendix B);
- Measures required by regulation at the federal, state, or local level;
- Measures included within the MDEQ Environmental Specifications (Attachment 1); and
- Additional discretionary mitigation measures required by Montana and other cooperating agencies.

Nonetheless, construction and operation of the proposed Project would result in some adverse impacts that could not be fully avoided, as summarized in this section. More detailed discussions about the potential impacts that could not be avoided are presented in Sections 3.1 through 3.12 of the EIS and in Sections I-3.1 through I-3.8 of this Appendix. Those discussions include the effects on specific species where appropriate. Most of the unavoidable adverse impacts would result from construction of the proposed Project and would be minor and either temporary or short term. None of the unavoidable adverse impacts would be significant.

### I-4.1 GEOLOGY

- Potential for a temporary increase in landslide risk during excavation activities in steep areas and at water crossings from vegetation clearing and alteration of surface drainage patterns.
- Damage or destruction of paleontological resources from grading and trench excavation.
- Potential that paleontological resources would not be accessible beneath the ROW during operation for the duration of the proposed Project.
- Lost access to potential sand, gravel, clay, and stone resources within the ROW for the duration of the proposed Project.

### I-4.2 SOILS AND SEDIMENTS

- Potential temporary to short-term increase in soil erosion where vegetation was cleared.
- Existing structure of some farmland soils might be altered by construction activities.
- Localized soil compaction in construction areas might lead to slower or less vegetation reestablishment following construction.
- Construction activities conducted during precipitation events or wet weather conditions might cause soil rutting and displacement and surface water pooling or water diversion which would increase localized soil erosion.
- Spills or leakage of fuels, lubricants, and/or coolants from construction equipment or vehicles could adversely affect soils.
- Construction in areas where drain tile systems were present would necessitate temporary disruption of those systems.
- Differential settling of soils in the ROW might occur after construction of the pipeline was completed.

- Pipeline operating temperatures might cause a minor and localized increase in soil temperature and a decrease in soil moisture content.

## I-4.3 WATER RESOURCES

- Disturbance of soils and vegetation in or near waterbody crossings during construction might result in temporary adverse impacts on water quality and turbidity.
- Water bodies might be adversely affected where erosion occurred and hazardous substances (such as pesticides or herbicides) were present in eroded material.
- Potential minor loss of floodplain area because of placement of proposed Project infrastructure within a floodplain.
- Temporary changes in surface water drainage patterns during construction.
- Minor long-term changes in surface water drainage patterns during operation where aboveground facilities were present and where minor topographic changes were made.

## I-4.4 WETLANDS

- Wetland hydrology might be altered such that wetland functions were reduced, or at some locations, eliminated.
- Alterations of wetland vegetation community composition and structure would occur and primarily be temporary, but in some instances permanent, due to clearing during construction and maintenance activities within the permanent ROW during operation.
- Removal of forested and scrub-shrub wetland habitats during construction would result in a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands along the permanent ROW.
- During construction across depressional wetlands, disturbance to supporting clay layers or small scale disturbances to topography and drainage might alter the retention capacity.
- Pipeline operating temperatures might result in slight increases in water temperatures where the proposed pipeline crossed through small wetlands. Small ponded wetlands crossed by the alignment might remain unfrozen a few days longer than surrounding wetlands and might thaw a few days sooner than surrounding wetlands. These temperature changes could have either positive or adverse effects on wildlife, depending on the species.

## I-4.5 TERRESTRIAL VEGETATION

- Clearing and grading sagebrush shrublands and forest communities would result in long-term to permanent changes in species composition and community structure (height and density) within the construction ROW.
- Maintenance of the permanent ROW would result in permanent impacts to forest and sagebrush communities, except for sagebrush up to 2 feet tall within the ROW.
- Installation of aboveground facilities would result in a permanent loss of vegetation at the facility sites where revegetation was not possible (e.g., concrete pads at pump stations and mainline valves).
- Some sensitive plants and their habitats might be lost during construction.

- Removal of vegetation from the ROW would increase the potential for noxious weeds and other invasive plants to colonize and might result in a small decrease of vegetation community diversity.

## I-4.6 WILDLIFE

- Construction would degrade or fragment wildlife habitats in and near the proposed construction ROW. The duration of the impact would range from temporary to long term and would include effects on known habitat for mule deer, white-tailed deer, and pronghorn winter ranges; greater sage-grouse and sharp-tailed grouse lek buffer zones; two prairie dog towns; and 49 raptor nests.
- Increased noise and human activity during construction might displace some wildlife in the vicinity of construction. This might interfere with foraging, breeding, and movements, depending on the construction schedule.
- Clearing, grading, and trenching would result in direct mortality of animals having limited mobility.
- Direct mortalities might occur as a result of collisions of animals with construction vehicles and equipment, maintenance and monitoring vehicles, and when birds collided with the electrical transmission lines associated with the pump stations.
- Indirect mortality and/or reduced reproduction might result from increased predation on grassland and shrubland nesting birds and small mammals by raptors using transmission line poles for perches.
- For wildlife that use trees and shrubs for cover, forage, and nesting, losses of these habitats would be long term or permanent because the permanent ROW would be maintained free of trees and large shrubs.
- Aerial surveillance and other traffic from routine construction and maintenance might cause a short-term alteration of behavior of individual animals.

## I-4.7 FISHERIES RESOURCES

- Temporary and localized obstructions to fish movement would occur during construction of some stream crossings.
- Trenching activities could result in displacement or mortalities to fish, macroinvertebrates, and amphibians.
- If scouring occurred from changes in bed conditions, it could affect species associated with stream bottom spawning, rearing, or feeding, or could temporarily affect fish movements during low flow periods.
- Open trench dry cuts would loosen sediments, making them more prone to suspension during initial post-construction streamflows and could result in a minor and temporary to short-term decrease in primary production.
- Elevated turbidity in and near dredging, wet trenching, and wet backfilling sites would result in temporary downstream deposition of fine sediments. That sedimentation could result in a temporary to short-term decrease in primary production.
- If contaminants were present in stream beds being crossed using the wet trenching method, contaminants might be released and could affect aquatic organisms. The likelihood of

encountering contamination would be low and dilution in the waterbody would likely result in a minor impact that would be temporary to short term.

- Impacts from an accidental release of bentonite would be limited to a short-term reduction in feeding success or the temporary suspension of migratory behavior or habitat used by foraging fish.
- Large volumes of water withdrawn for hydrostatic testing would reduce the amount of water available for use by fish and could temporarily result in decreased mobility, increased susceptibility to predation, increased stress-related energy expenditures of fish, habitat abandonment, and deterioration or temporary loss of habitat.

## I-4.8 THREATENED AND ENDANGERED SPECIES

- Construction would result in the disturbance or removal of native prairie, wetland, and woodland habitats in the construction ROW that might include suitable habitat for sensitive species.
- Surface disturbances during construction could result in the loss or alteration of potential breeding and/or foraging habitats for sensitive species and short-term fragmentation of those habitats until native vegetation became reestablished.
- Direct mortality of less mobile sensitive species could occur from collisions with construction vehicles and construction equipment, and the potential abandonment of a nest site or territory, including the loss of eggs or young.
- More mobile sensitive species might experience a temporary to short-term displacement from areas within and near the ROW during construction as a result of increased noise, activity, and human presence.

## I-4.9 LAND USE, VISUAL RESOURCES, AND RECREATION

- Existing land uses within the active construction zone along the construction ROW would be stopped for the duration of construction.
- Some developed land uses in close proximity to the construction ROW might experience indirect effects from dust, noise, and activity in the construction zone.
- Most land uses along the construction ROW would be returned to pre-construction uses after construction was completed. However, aboveground facilities would permanently convert existing uses to an industrial use.
- Land in the construction ROW that is currently enrolled in the Conservation Reserve Program (CRP) in Montana would be temporarily affected. Keystone would compensate landowners for any loss of CRP payments resulting from Project-related activities.
- From the start of construction on cropland until the next crop was planted, there would be an impact on agricultural use of the construction ROW. However, Keystone would compensate farmers for crop losses resulting from construction.
- Placement of pump stations and mainline valves in cropland would result in the loss of that land for agricultural purposes for the life of the proposed Project. However, Keystone would reach compensation agreements with landowners for crop losses and would avoid or provide the least hindrance to adjacent agricultural operations.

- Construction would alter the existing visual quality in the vicinity of the proposed route from the presence of construction equipment and activity, the loss of vegetation, and the presence of aboveground facilities under construction.
- Although no recreation facilities would be affected in Montana, construction activities along the construction ROW and noise from construction might temporarily affect recreation experiences in the vicinity of the active construction area.
- During operation, the aboveground industrial facilities would alter the visual quality of the rural areas along the proposed route.

### I-4.10 SOCIOECONOMICS

- Some land would be affected in the long term along the proposed ROW. Land values and uses along the proposed ROW could be affected.
- Construction and operation of the proposed Project would not have unavoidable adverse impacts on population, housing, economic activity, tax revenues, fiscal resources, or public services.

### I-4.11 CULTURAL RESOURCES

- Mitigation measures are being developed for any significant unavoidable adverse impacts to cultural resources that are identified during the EIS process from construction and operation of the proposed Project, and a Memorandum of Agreement (MOA) that codifies those mitigations will be prepared. It might not be possible to identify all unavoidable adverse impacts to cultural resources associated with the construction of the proposed Project prior to initiation of grading and excavation. To address those potential impacts, DOS and the consulting parties under Section 106 of NHPA are negotiating a Programmatic Agreement that would provide a method for development of mitigation measures for unanticipated potential impacts to cultural resources identified during the construction and operation of the proposed Project.

### I-4.12 AIR QUALITY AND NOISE

#### I-4.12.1 AIR QUALITY

- Temporary and localized air quality impacts would occur during construction as a result of emissions of fugitive dust and emissions from fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.
- Impacts associated with operation would include minimal fugitive emissions from pipeline connections and pumping equipment at the pump stations, and minimal emissions from fossil fuel mobile sources used during maintenance and monitoring activities.

#### I-4.12.2 NOISE

- During construction, sound levels would increase in the vicinity of the proposed construction ROW resulting in temporary impacts to agricultural, residential, and commercial areas within 500 feet of the proposed construction ROW.
- During operation, sound levels would increase up to 2,300 feet from each pump station. However, no structures would be within 0.5 mile (2,640 feet) of the pump stations.

## I-5.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

MEPA requires that the EIS describe any irreversible and irretrievable commitments of resources that would be involved in the proposed action if it is implemented. An irreversible resource commitment is defined as the loss of future options and the effect that use of the resource would have on future generations. It applies primarily to non-renewable resources, such as minerals, and to those resources that are renewable only over long time spans, such as soil productivity. An irretrievable commitment of resources results from the loss of production or harvest, or the use of renewable resources. Opportunities for other uses of those resources during the period of the proposed action are not possible. The decision to use the resource can be reversed (e.g., after the life of a project), but the forgone use opportunities are irretrievable.

For the proposed Project, most resource commitments would neither irreversible nor irretrievable. As described in Sections 3.1 through 3.12 of the EIS, most impacts would be short term and temporary. There would not be any irretrievable or irreversible commitments of threatened and endangered species, transportation, recreation, or public services associated with construction and normal operation of the proposed Project within Montana. The following sections provide summaries of the irreversible and irretrievable commitments of resources that would result from implementation of the proposed Project.

### I-5.1 ENERGY, MATERIALS, AND LABOR

The use of materials for construction of the proposed Project, such as steel, concrete, aluminum, plastics, and glass, would be both an irretrievable and irreversible commitment of resources if the materials were not recycled at the end of the proposed Project. Fossil fuel used for energy during construction and operation of the proposed Project would be an irreversible commitment of that resource. Electrical energy consumed by the pump stations that was not renewable would also be irreversible, but the use of renewable energy would be an irretrievable commitment of energy. Labor required for construction and operation of the proposed Project would also be an irretrievable commitment of resources.

Construction materials, energy, and labor are not in short supply, and their use for the proposed Project would not have an adverse impact on their future availability for other uses.

### I-5.2 OTHER RESOURCES

Table I-5.2-1 lists the irreversible and irretrievable commitments of resources that would occur from implementation of the proposed Project.

**TABLE I-5.2-1**
**Summary of Irreversible and Irretrievable Commitments of Resources from Implementation of the Proposed Project in Montana**

| Resource | Irreversible Commitment | Irretrievable Commitment | Explanation |
|---|---|---|---|
| Geology | Yes | Yes | Use of gravel, sand, and rock during construction would be irreversible. Loss of access to mineral resources within the permanent ROW would be an irretrievable commitment of resources. |
| Soils and Sediments | No | Yes | Soils would be eroded from disturbed areas, but would not be irreversibly lost. Soil compaction may occur in some areas and could be an irretrievable commitment until the soil is loosened mechanically or naturally. |
| Water Quality and Quantity | No | Yes | Water obtained for hydrostatic testing would be tested and discharged to stable upland areas. A small portion of streamflow would be lost irretrievably due to water withdrawal during hydrostatic testing. |
| Wetlands | Yes | Yes | Construction across wetlands would result in a temporary irretrievable loss of wetland function and in some areas may result in a permanent irreversible loss of wetland function. |
| Terrestrial Vegetation | No | Yes | Vegetation would be irretrievably removed from the sites of aboveground facilities. Forest, sagebrush, and other woody vegetation would be irretrievably removed from the construction ROW and except for sagebrush up to 2 feet in height, would not be allowed to reestablish within 15 feet of either side of the pipeline centerline or under electrical transmission lines. |
| Terrestrial Wildlife | Yes | Yes | Mortality of relatively non-mobile individual animals would be an irreversible commitment. Removal or alteration of wildlife habitat would be an irretrievable commitment. |
| Fisheries | No | Yes | There would be no irreversible commitments of fisheries resources. A small portion of streamflow and the associated fisheries habitat would be irretrievably lost due to water withdrawal during hydrostatic testing. |
| Land Use, Recreation, and Visual Resources | No | Yes | Agricultural crops and timber may be lost irretrievably along the construction ROW during the active construction period, and forestland would not be allowed within 15 feet of the pipeline centerline during operation.<br>Land used for aboveground facilities, access roads, and the permanent ROW would be an irretrievable commitment.<br>Alterations of visual quality due to the presence of the permanent ROW and Project-related facilities would be an irretrievable commitment. |
| Socioeconomics | Yes | Yes | Funds expended on the proposed Project would be an irreversible commitment. Labor and resources expended on construction of the proposed Project would be an irretrievable commitment. Energy used during construction and operation would be an irretrievable commitment. Increases in the property-tax basis of land dedicated to the proposed Project would be an irreversible commitment. |
| Cultural Resources | No | No | Implementation of the cultural resources Programmatic Agreement would result in mitigation of cultural resources impacts, and therefore there would not be an irreversible or irretrievable commitment of those resources. |
| Air Resources | No | Yes | There would be minor, short-term irretrievable commitments of air resources during construction and possibly minor irretrievable commitments of air resources during operations. |

## I-6.0 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section addresses the tradeoffs between short-term uses of the environment and maintenance and enhancement of long-term productivity of resources; it does not repeat the analyses provided in the main body of the EIS and in Section I-3.0 of this appendix. Short-term uses of resources associated with the proposed Project in Montana are defined as uses during the life of the proposed Project. Long-term productivity involves sustaining the interrelationships of each resource in a condition sufficient to support ecological, social, and economic health during and after the life of the proposed Project.

Implementation of the proposed Project would result in primarily temporary impacts (lasting only for the duration of construction) or short-term impacts (lasting up to 3 years after construction), including impacts to wetlands, some vegetation (some vegetation would require more than 3 years to recover), terrestrial wildlife, most land use (exceptions would be the pump stations which would remain through the life of the proposed Project), air quality, and noise levels. Keystone would minimize the impacts through incorporation of the procedures described in its CMR Plan (Appendix B), in Section 2.0 of the EIS, and throughout Sections 3.1 through 3.12 of the EIS, and the procedures required in MDEQ's Environmental Specifications (Attachment 1).

Construction and operation of the proposed Project would be accomplished in accordance with the applicable regulatory standards for water quality, biological resources, cultural resources, and air quality. After termination of the proposed Project, all affected resources are expected to be able to return to conditions that are identical or similar to those that existed prior to implementation of the proposed Project. Therefore, long-term productivity of the resources affected by the proposed Project would be maintained.

Economic activity in the vicinity of the proposed Project in Montana would be aided in the short term by the economic benefit of wages earned by local construction workers, by local construction purchases made by Keystone, and by local purchases made by construction workers. Longer-term benefits to economic activity would include any purchases made by Keystone during proposed Project operation, four to eight permanent jobs, and property taxes generated for the duration of the proposed Project.

## I-7.0 REGULATORY RESTRICTIONS

In 1995, the Montana Legislature amended MEPA to require Montana state agencies to evaluate in their environmental documents any regulatory restrictions proposed to be imposed on the use of private property (Section 75-1-201(1)(b)(iv)(D), MCA). The cost of mitigation measures designed to make a project meet minimum environmental standards with implementation methods specifically required by federal or state laws and regulations does not need to be evaluated under the implementing guidelines for the requirement. The procedures presented in Keystone's CMR Plan (Appendix B) are Keystone's proposal and, therefore, not subject to the economic evaluation requirement. The remainder of this section addresses the estimated cost of discretionary mitigation measures recommended by the cooperating agencies in the EIS or that MDEQ has legal discretion to require.

### I-7.1 MITIGATION MEASURES

Table I-7.1-1 lists the mitigation measures recommended for the proposed Project in Montana, along with an indication of what the impacts would be with and without the mitigation measures, and a cost estimate for each mitigation measure.

**TABLE I-7.1-1**
**Estimated Costs of Mitigation Measures Recommended by Montana Agencies for the Proposed Project**

| Recommended Mitigation Measure | Intent of Mitigation Measure | Anticipated Result of Implementation of Mitigation Measures | Comments and Cost Estimate |
|---|---|---|---|
| Mitigate potential impacts to greater sage-grouse and sharp-tail grouse. | Enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species in eastern Montana at designated mileposts. | Fragmentation and loss of sagebrush communities has contributed to the decline of greater sage-grouse and other sagebrush-dependant wildlife species. A compensatory mitigation fund could help secure protection for quality sagebrush habitat and rehabilitate damaged habitat. | Establish a compensatory mitigation fund of $600 per acre to be used by MDEQ, BLM, and MFWP. |
| Mitigate potential impacts to greater sage-grouse and sharp-tail grouse. | Determine whether the presence of proposed Project facilities have affected sage-grouse numbers based on the peak number of males in attendance at leks within 3 miles of facilities. | Human activities, such as the construction and operation of pipelines, can affect sage-grouse behavior and possibly lead to declines in local populations. A study of lek attendance can help to determine if pipeline-related activities do affect sage-grouse, and what those effects might be. | Under the direction of MDEQ, MFWP, and BLM, fund a study for four years. |
| Avoid crossing water ponds and/or reservoirs. | Avoid impacts to water ponds and/or reservoirs. | The proposed route does not cross any reservoirs and crosses only one stock water pond. The impact to the stock pond could be avoided by rerouting the pipeline to avoid the pond. Other impacts associated with routing the pipeline around the pond have not been identified since Keystone has not been given permission by the landowner to enter the property. | The estimated cost of rerouting the pipeline around the stock water pond is approximately $30,000. |
| Avoid wet crossings (such as the flowing open-cut method) of any stream, lake, reservoir, or pond. | Avoid impacts to streams, lakes, reservoirs, or ponds. | The proposed route does not cross any lakes or reservoirs in Montana and only one stock water pond. The waterbody crossing procedures in the Keystone Construction Mitigation and Reclamation (CMR) Plan are designed to address specific resource issues. With implementation of those procedures, impacts to streams crossed would be minor and temporary to short term.<br><br>With implementation of the recommended mitigation measure (such as the dam and pump, dry flume, or horizontal directional drilling methods), impacts would be reduced to minor and temporary. | To cross all flowing streams with one of the dry crossing methods described in Keystone's CMR Plan would add $19.7 million to the proposed Project costs. However, some streams are too wide to use the dry crossing method and would require the HDD method; those sites have been identified and are included in proposed Project cost estimates. If additional sites are identified that require HDD to avoid wet crossings, the proposed Project costs would increase; these costs would be dependent on the subsoil conditions encountered and the length of the crossing and cannot be estimated with certainty. |

**TABLE I-7.1-1**
**Estimated Costs of Mitigation Measures Recommended by Montana Agencies for the Proposed Project**

| Recommended Mitigation Measure | Intent of Mitigation Measure | Anticipated Result of Implementation of Mitigation Measures | Comments and Cost Estimate |
|---|---|---|---|
| Construction equipment and construction-related vehicles crossing a water body should use a crossing location that is within the dewatered reach created by the selected dry crossing construction method. | Avoid impacts to waterbodies due to use of equipment bridges. | With incorporation of the waterbody crossing procedures in the Keystone CMR Plan, Keystone would use methods to cross streams that are designed to minimize impacts. The impact to streams due to the use of equipment bridges is expected to be minor and temporary to short term.<br><br>Implementation of the mitigation measure would reduce the impacts of some equipment crossings, but would increase the duration of the presence of stream flow control devices (e.g., dams and flumes). The impact to stream habitats may increase at some locations where the stream flow control devices remain in place and may be reduced at some stream locations. | The costs to cross streams are included in the costs described above. Implementation of this mitigation method would require that the bridge crossing be established over the dewatered area in the beginning of construction and be maintained through the entire construction season to allow crews to move through the area |

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# APPENDIX N

## Figures

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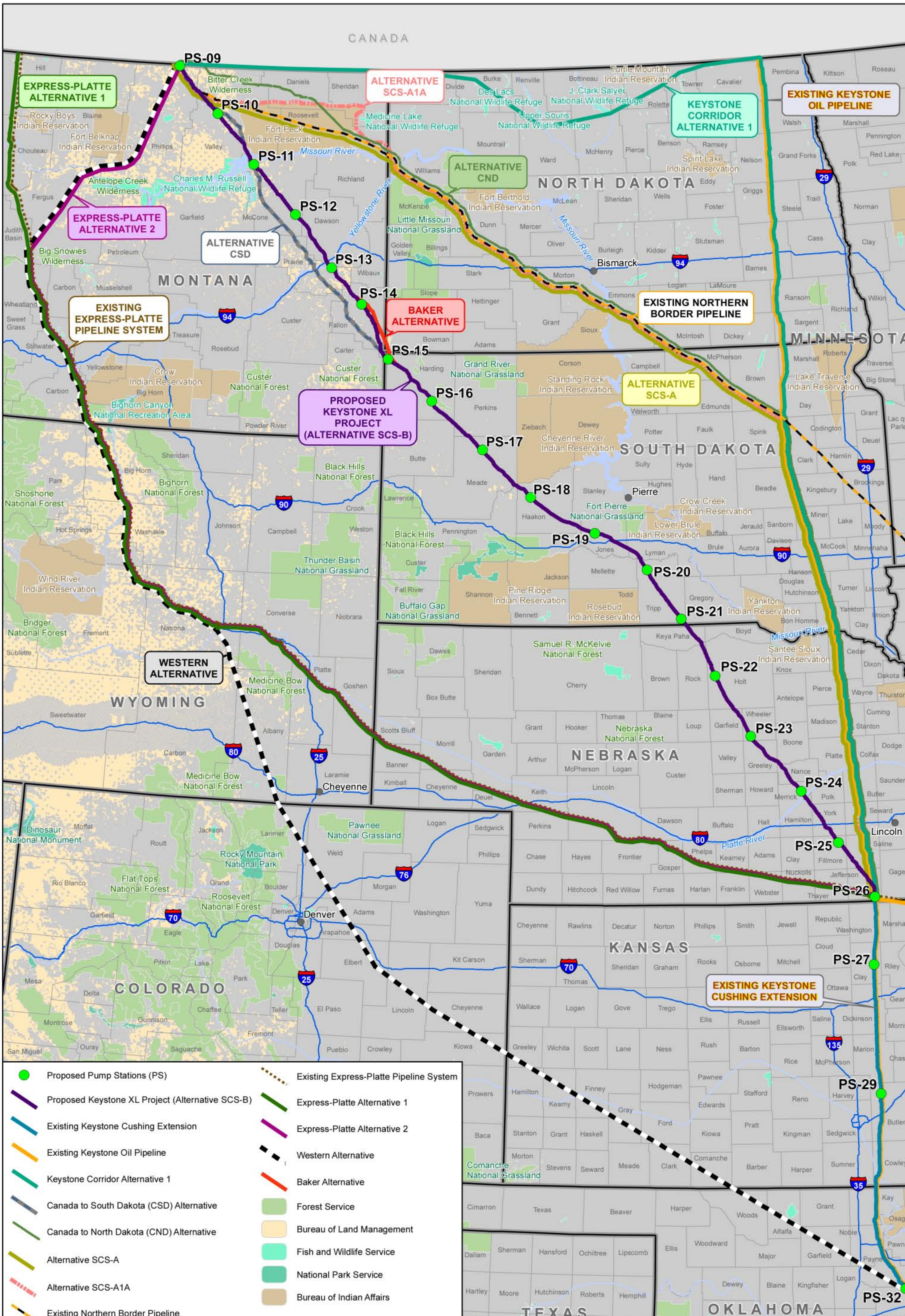


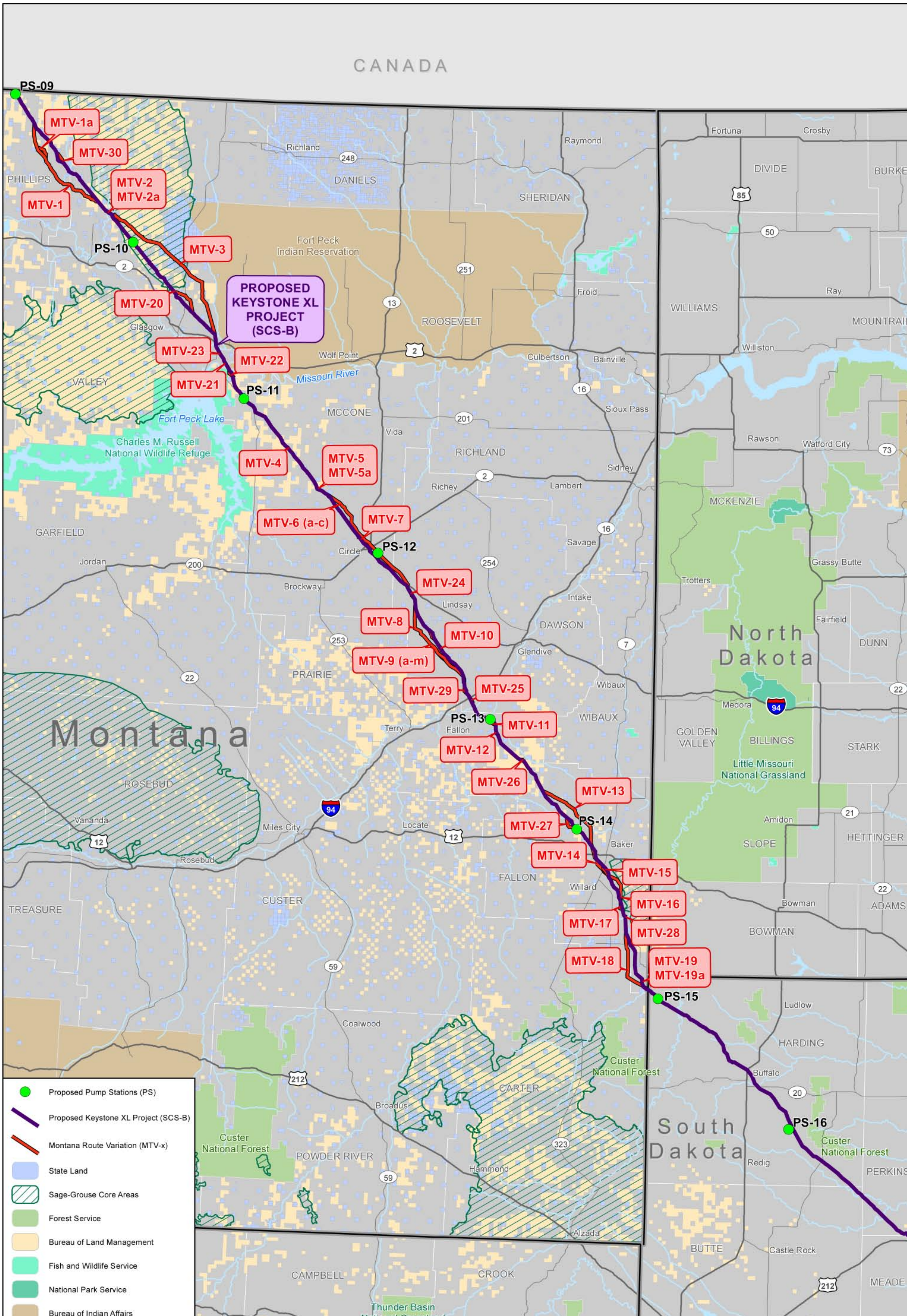

Data Sources: Federal Lands, Basemap - ESRI.

0 20 40 80 Miles

**KEYSTONE XL PROJECT**

Figure I-2.3-1

Montana Route Alternatives




Data Sources: Federal Lands, Basemap - ESRI,
Sage-Grouse - MFWP,
State Land - MT Cadastral/CAMA Project.

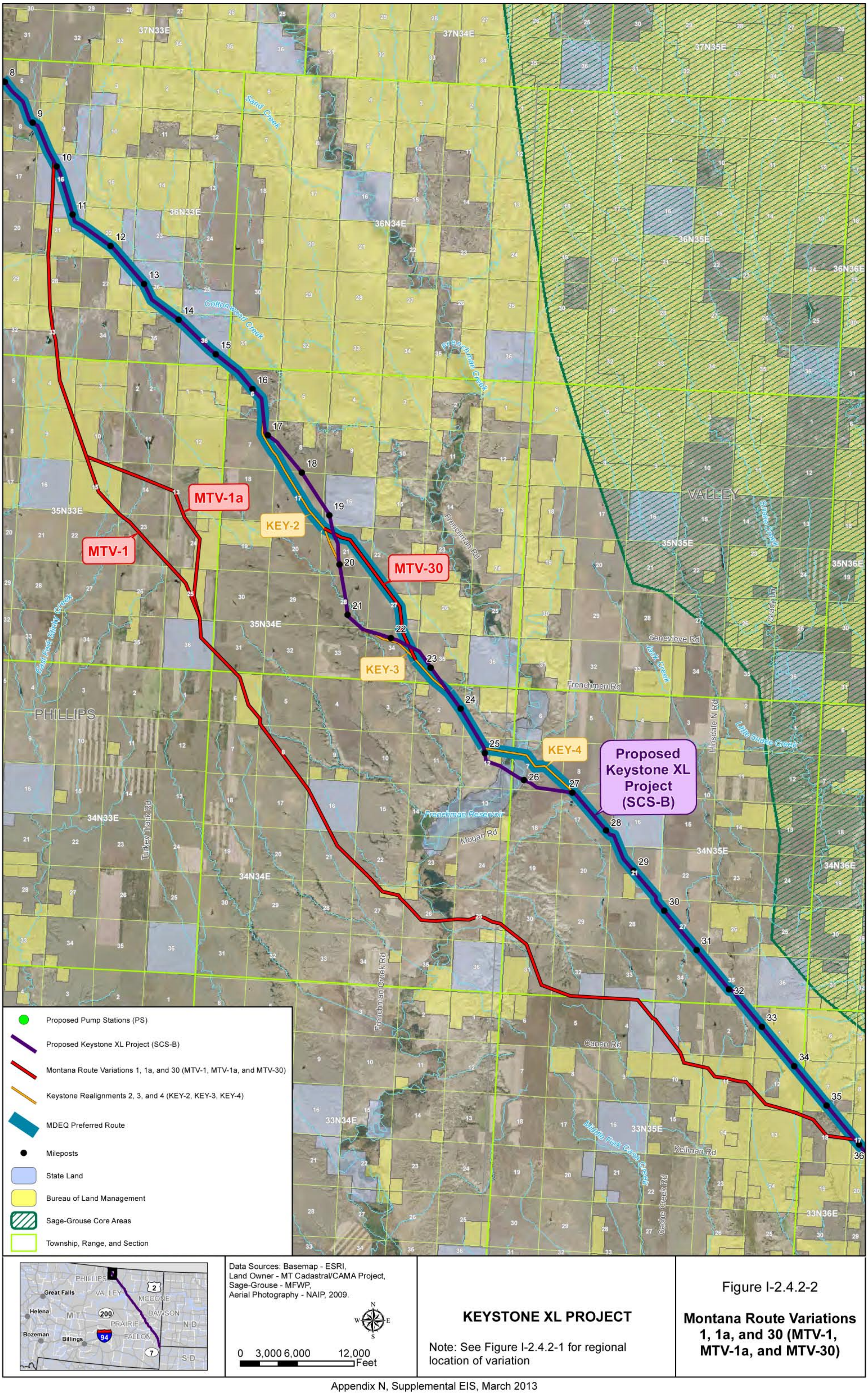
0 5 10 20
Miles

**KEYSTONE XL PROJECT**

Note: See Figures I-2.4.2-2 through I-2.4.2-24 for additional details

Figure I-2.4.2-1

Montana Route Variations



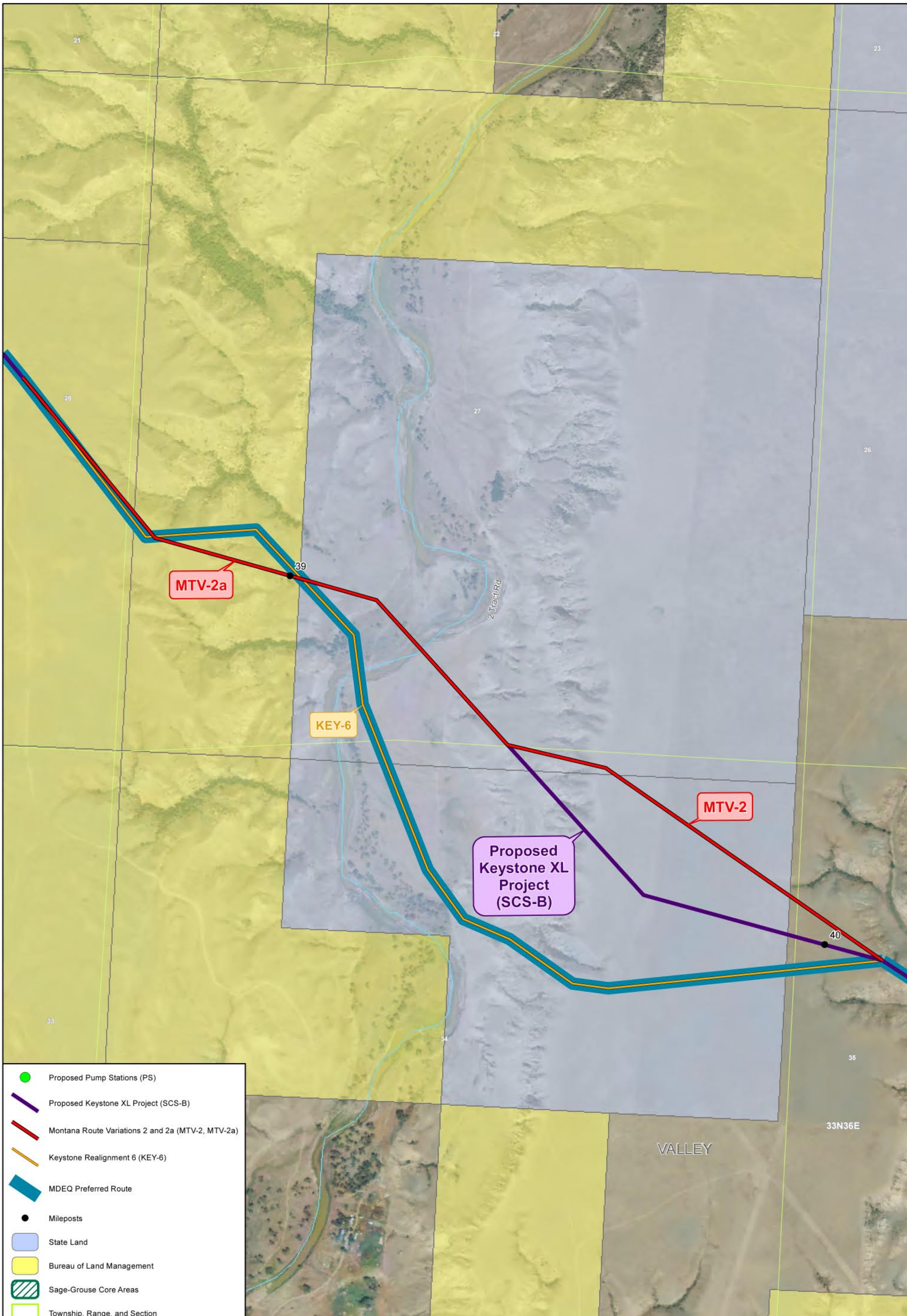

Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-2

**Montana Route Variations 1, 1a, and 30 (MTV-1, MTV-1a, and MTV-30)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

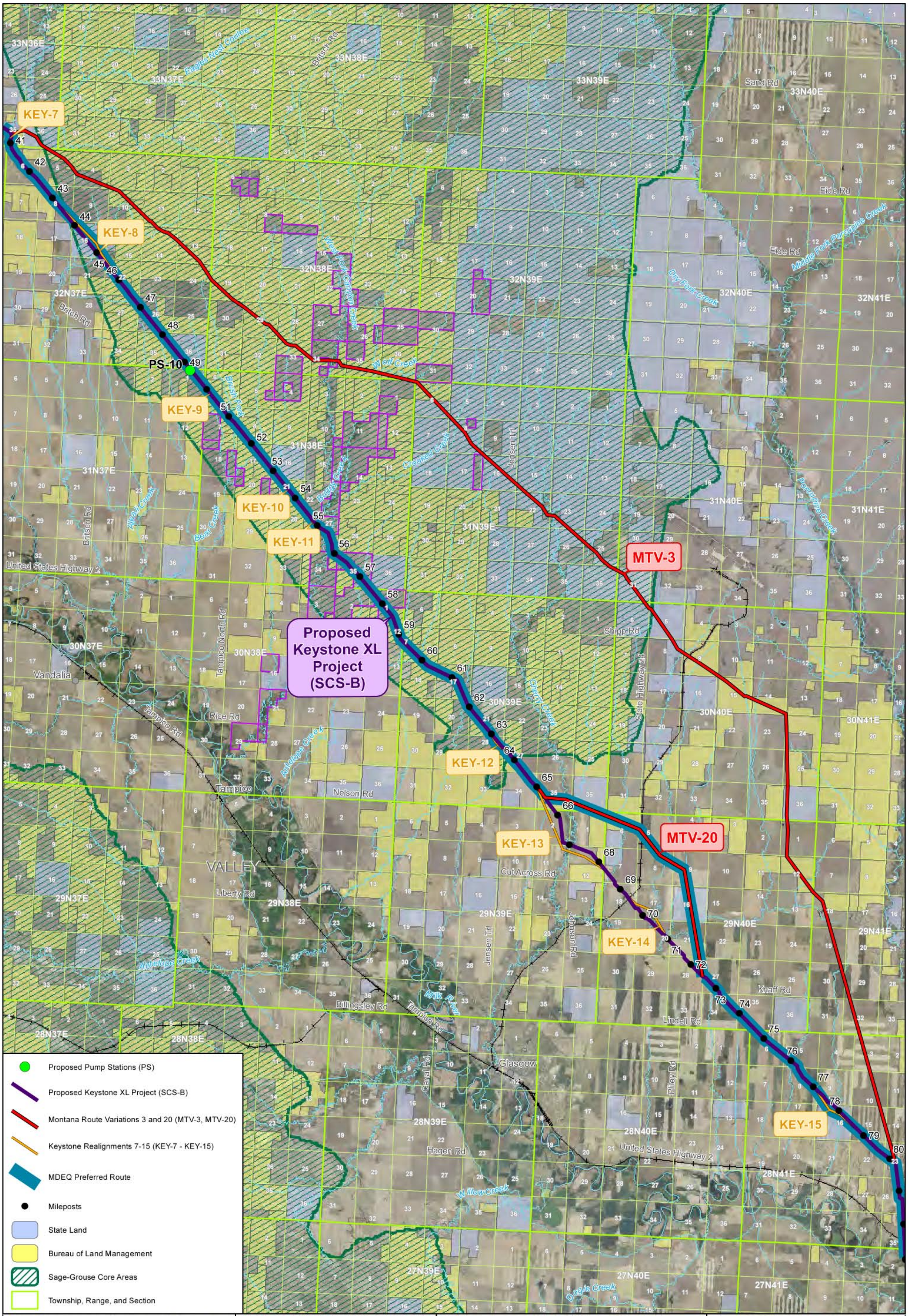
0 250 500 1,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-3

**Montana Route Variations 2 and 2a (MTV-2, MTV-2a)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009,
Cornwell Ranch Conservation Easement - NC.

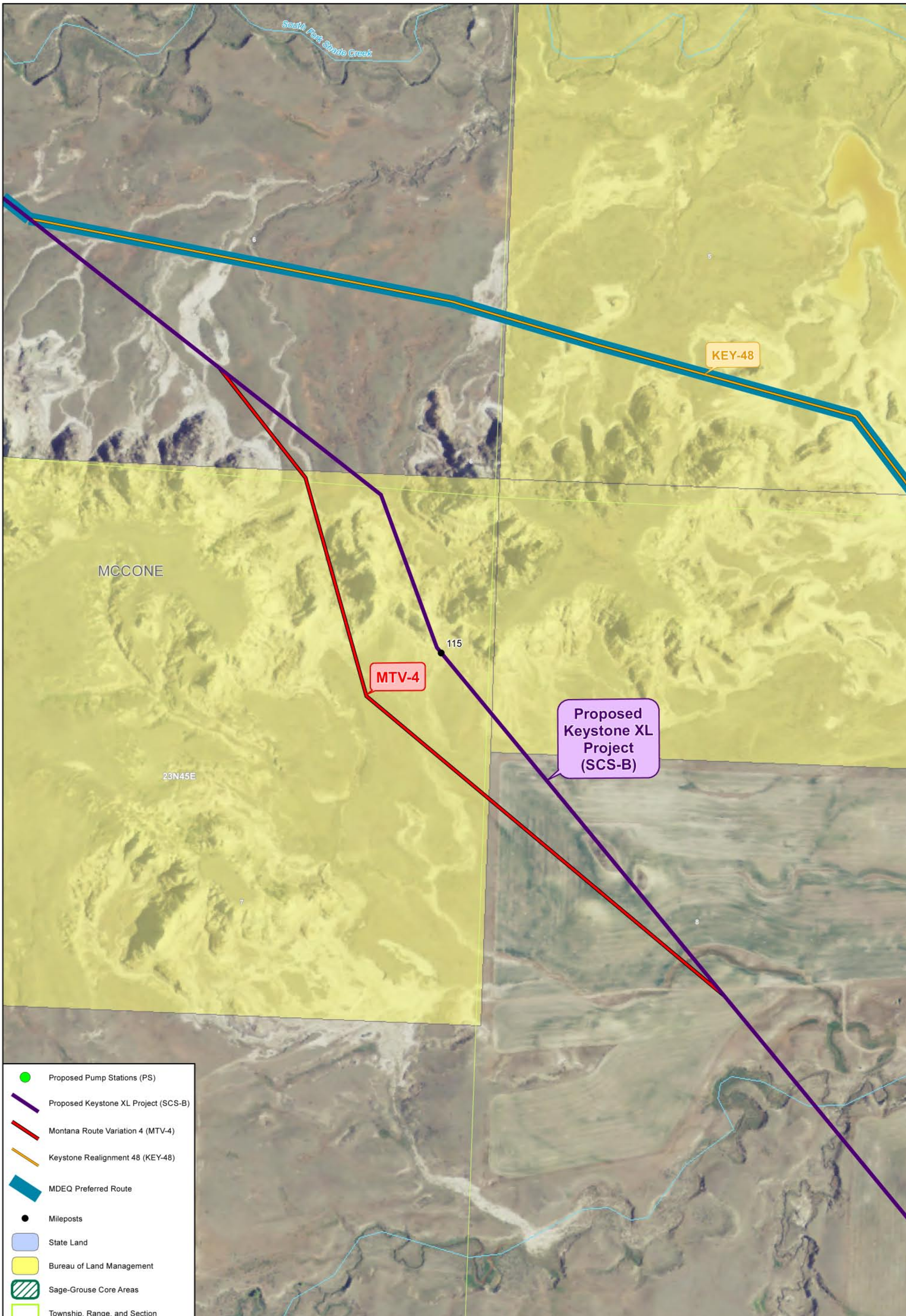
0 0.75 1.5 3 Miles

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-4

**Montana Route Variations 3 and 20 (MTV-3, MTV-20)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

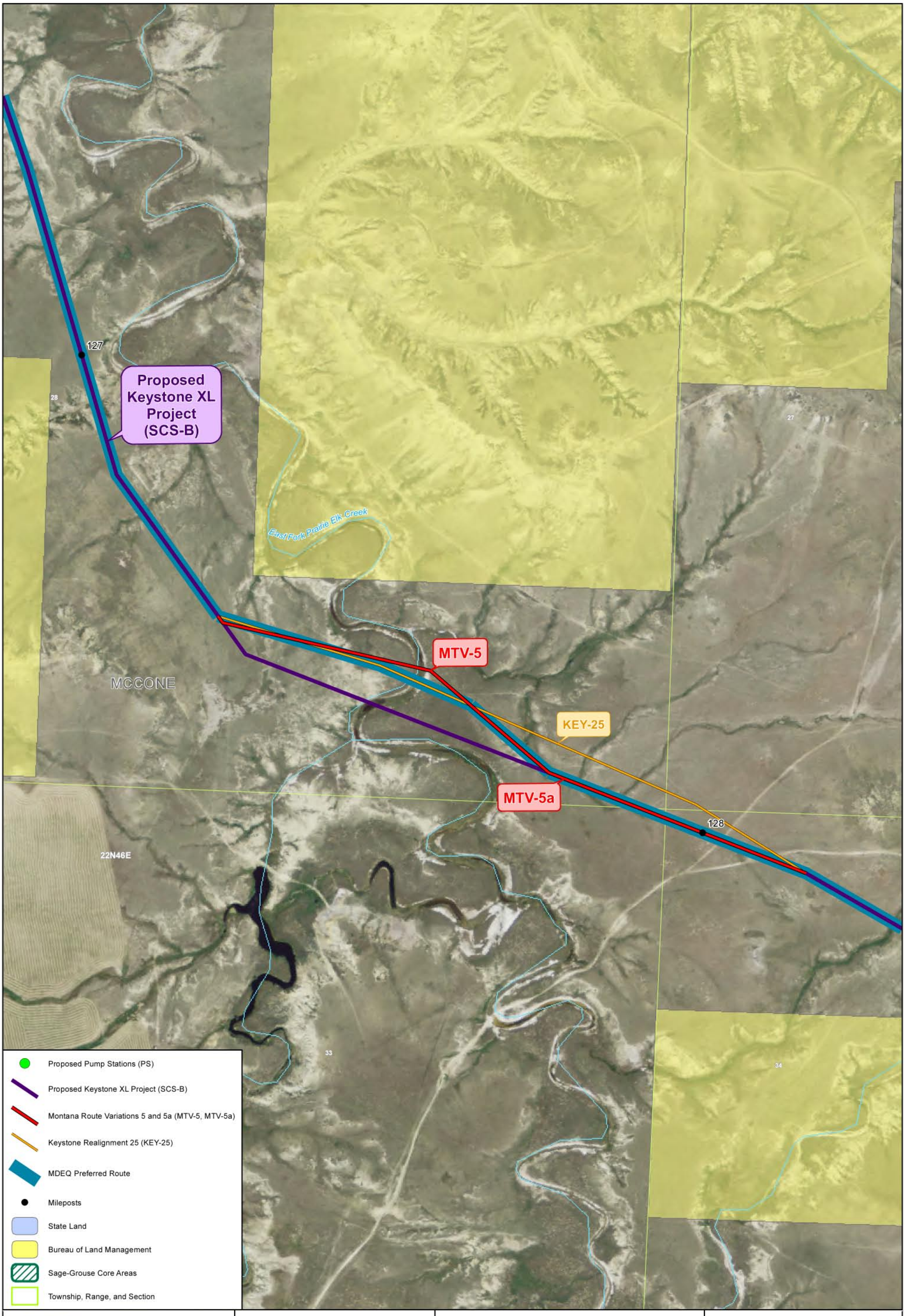
0 125 250 500 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-5

**Montana Route Variation 4 (MTV-4)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

KEYSTONE XL PROJECT

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-6

**Montana Route Variations 5 and 5a (MTV-5, MTV-5a)**



Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

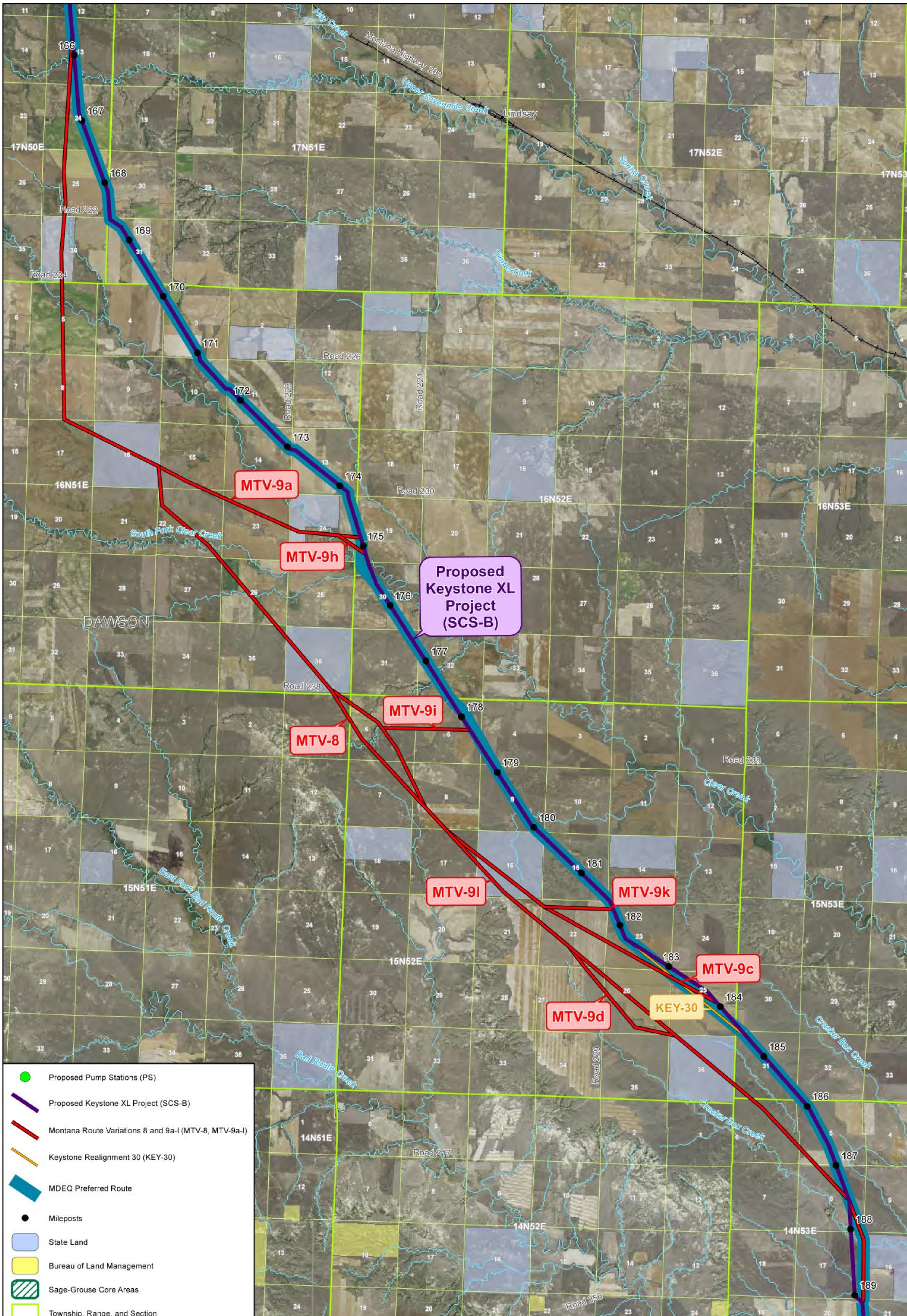
0 0.5 1 2 Miles

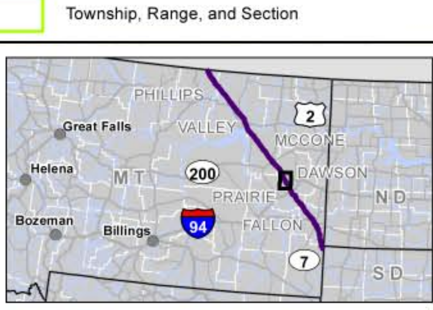
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-7

**Montana Route Variations 6, 6a-c, and 7 (MTV-6, MTV-6a-c, MTV-7)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

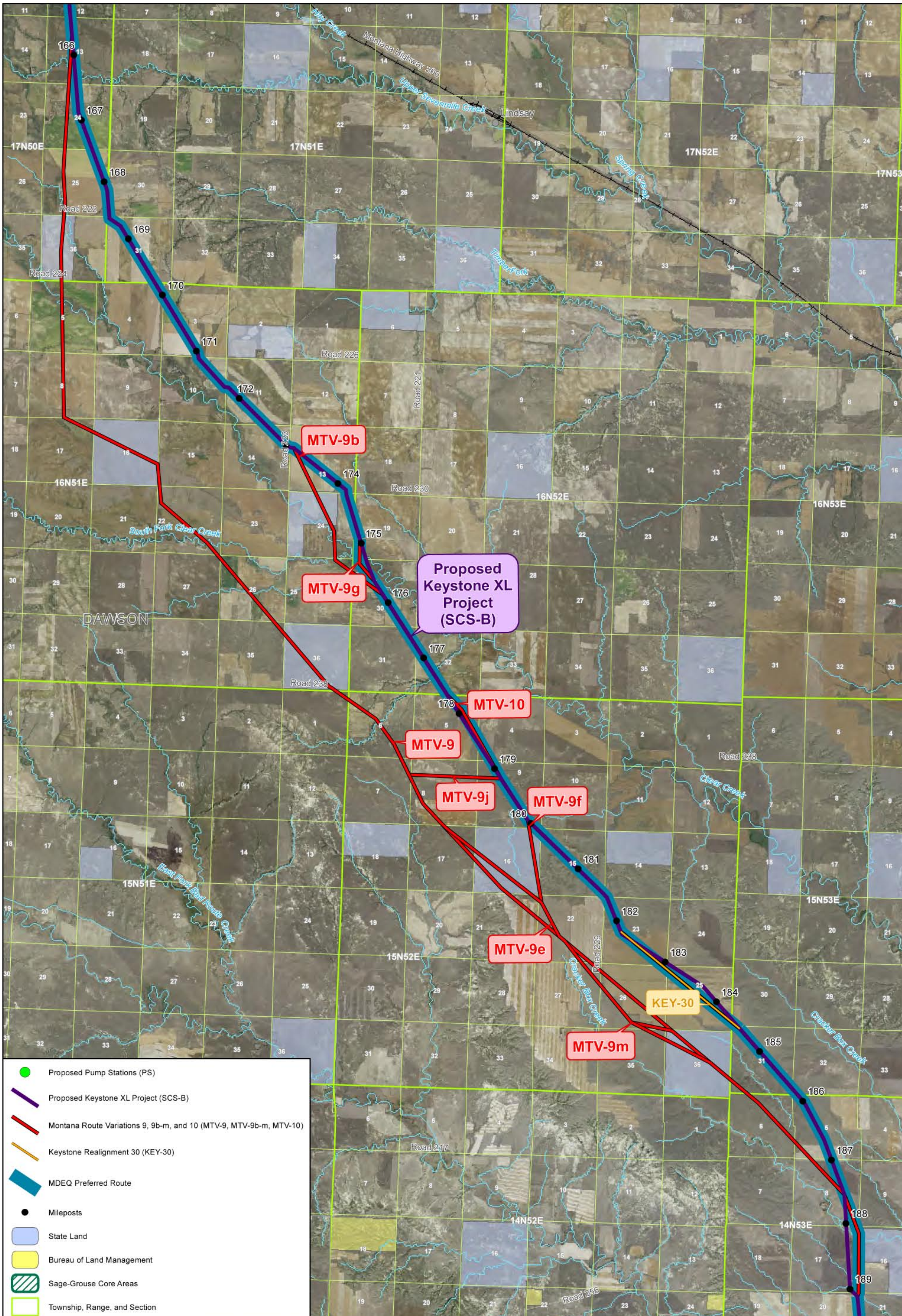
0 0.5 1 2 Miles

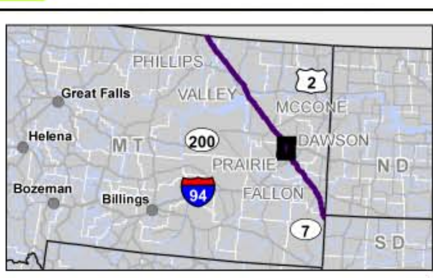
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-8a

**Montana Route Variations 8 and 9a-l (MTV-8, MTV-9a-l)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

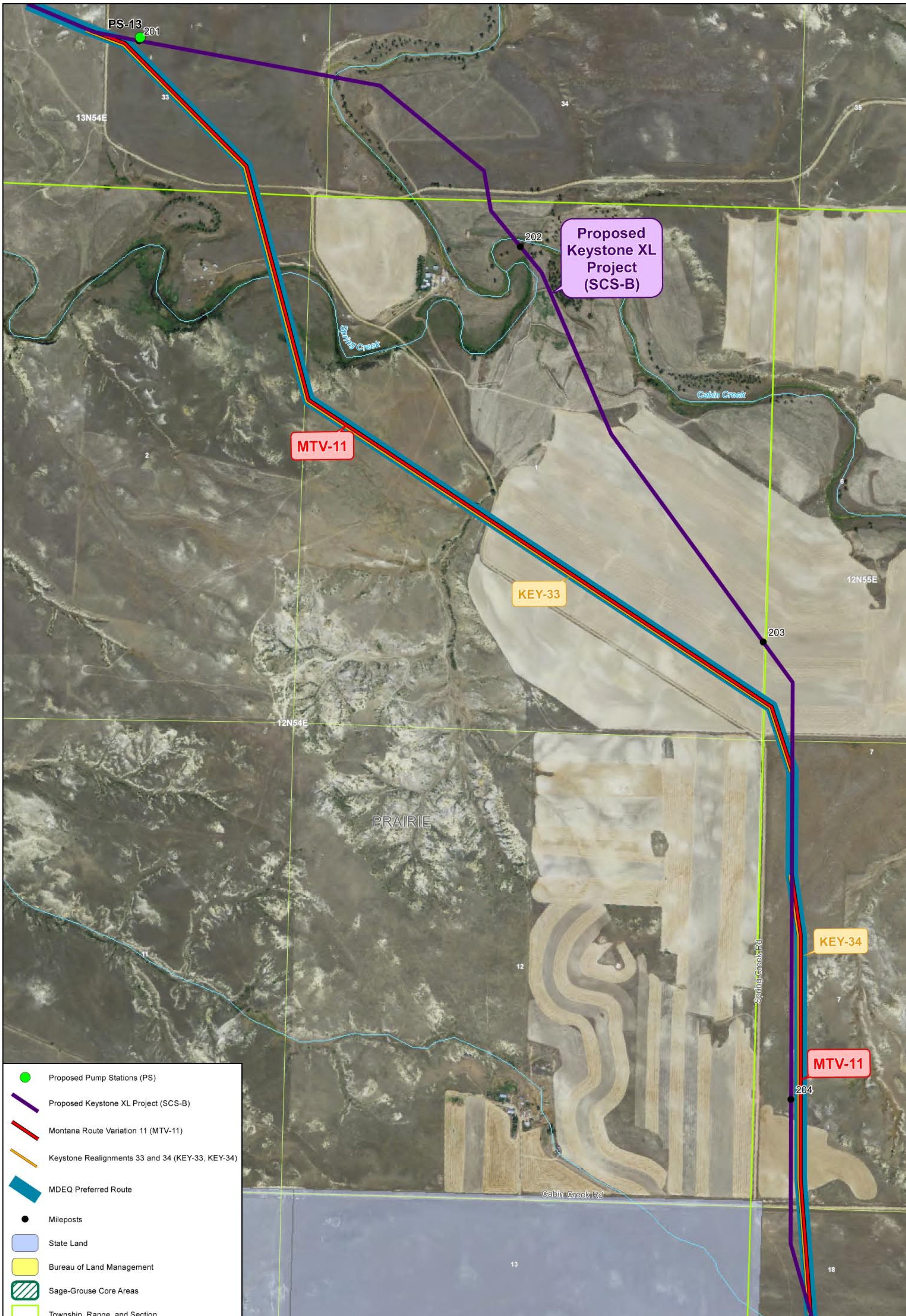
0 0.5 1 2 Miles

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-8b

**Montana Route Variations 9, 9b-m, and 10 (MTV-9, MTV-9b-m, MTV-10)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

0 375 750 1,500 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-9

**Montana Route Variation 11 (MTV-11)**



Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

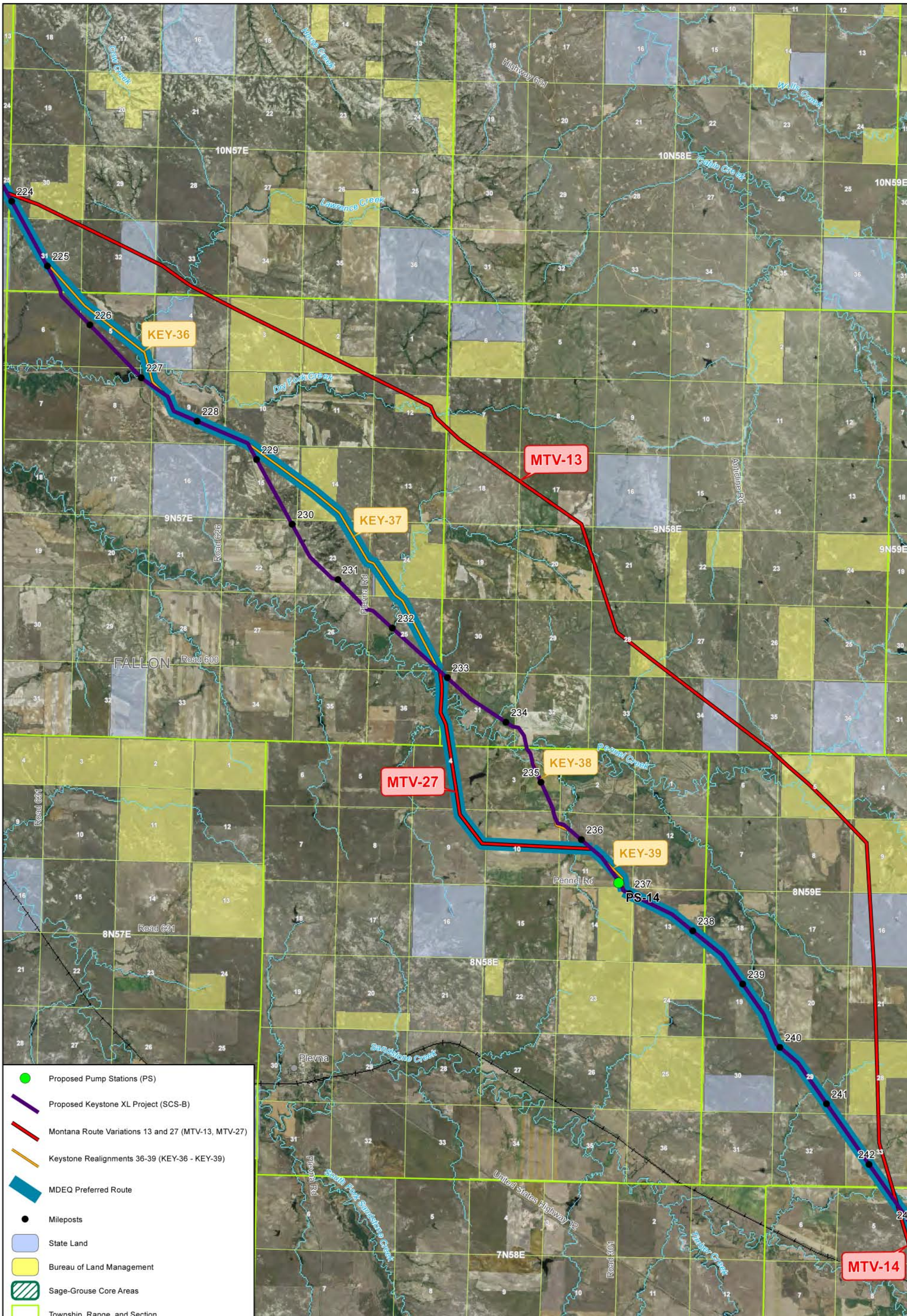
0 125 250 500 Feet

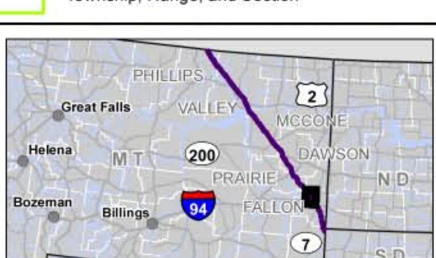
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-10

**Montana Route Variation 12 (MTV-12)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

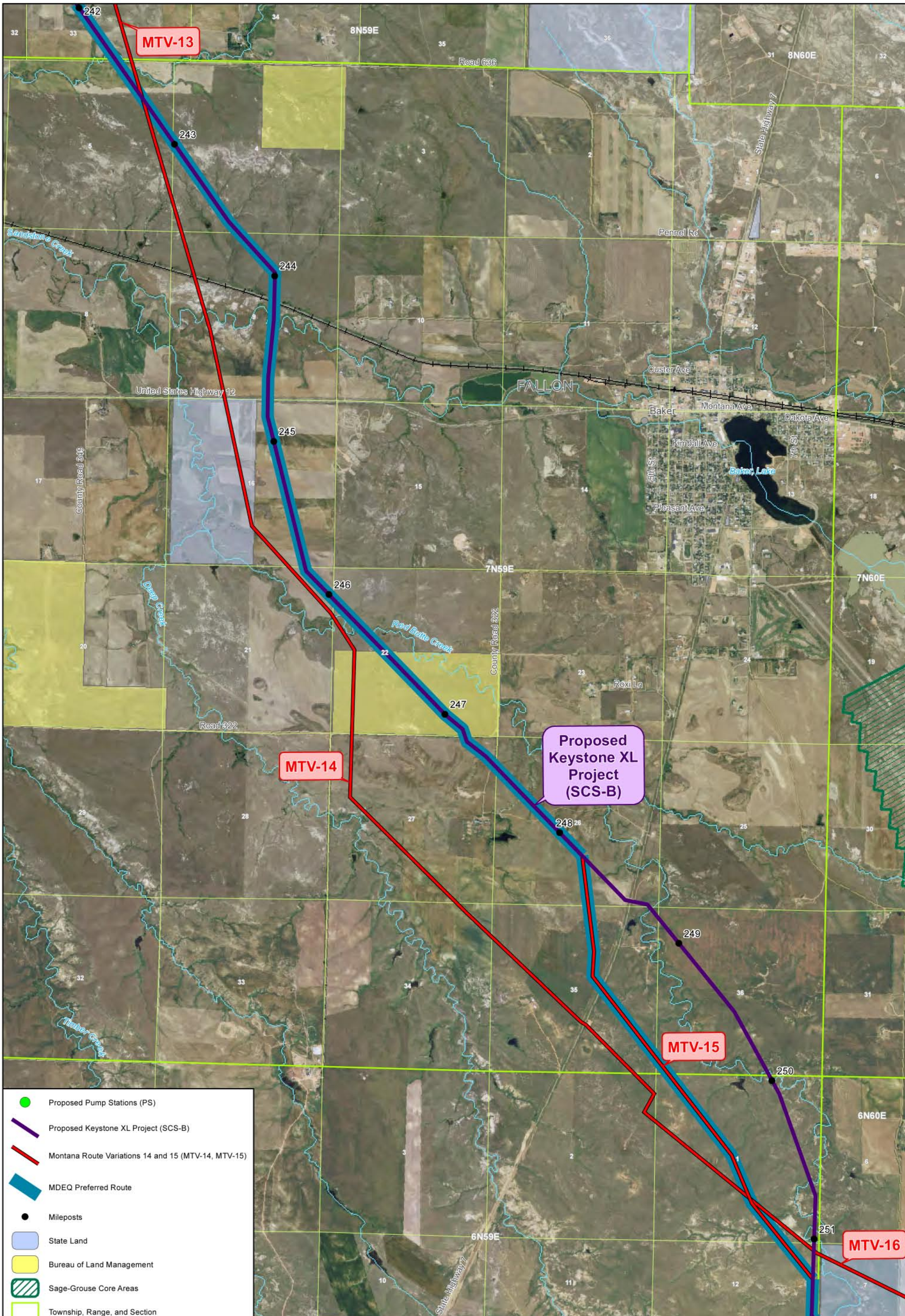
0 2,0004,000 8,000 Feet

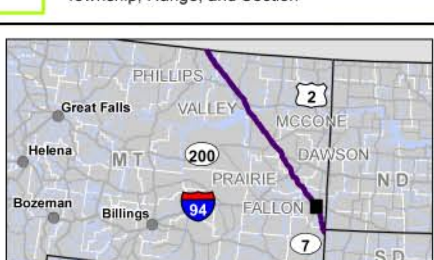
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-11

**Montana Route Variations 13 and 27 (MTV-13, MTV-27)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

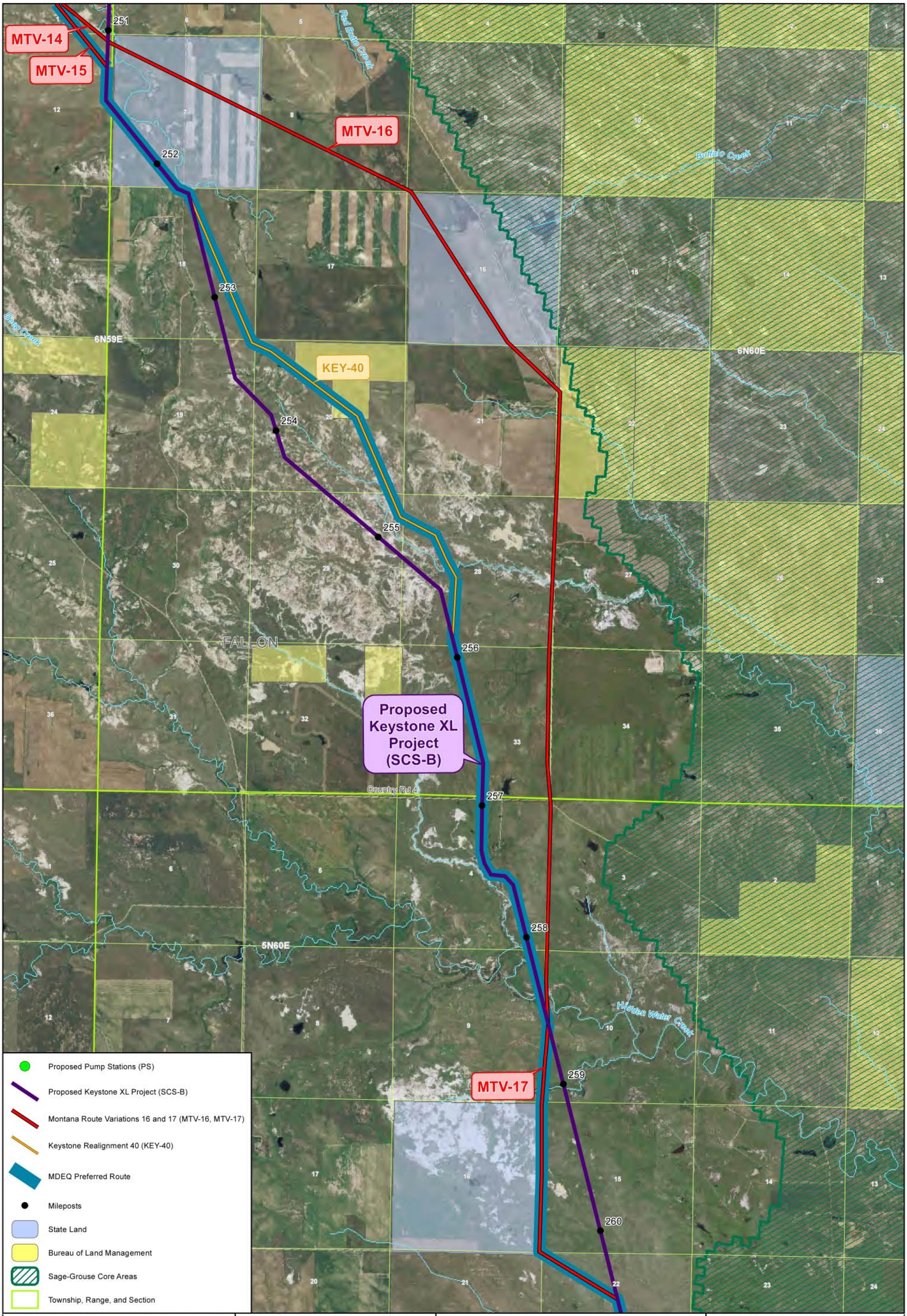
0 1,000 2,000 4,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-12

**Montana Route Variations 14 and 15 (MTV-14, MTV-15)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

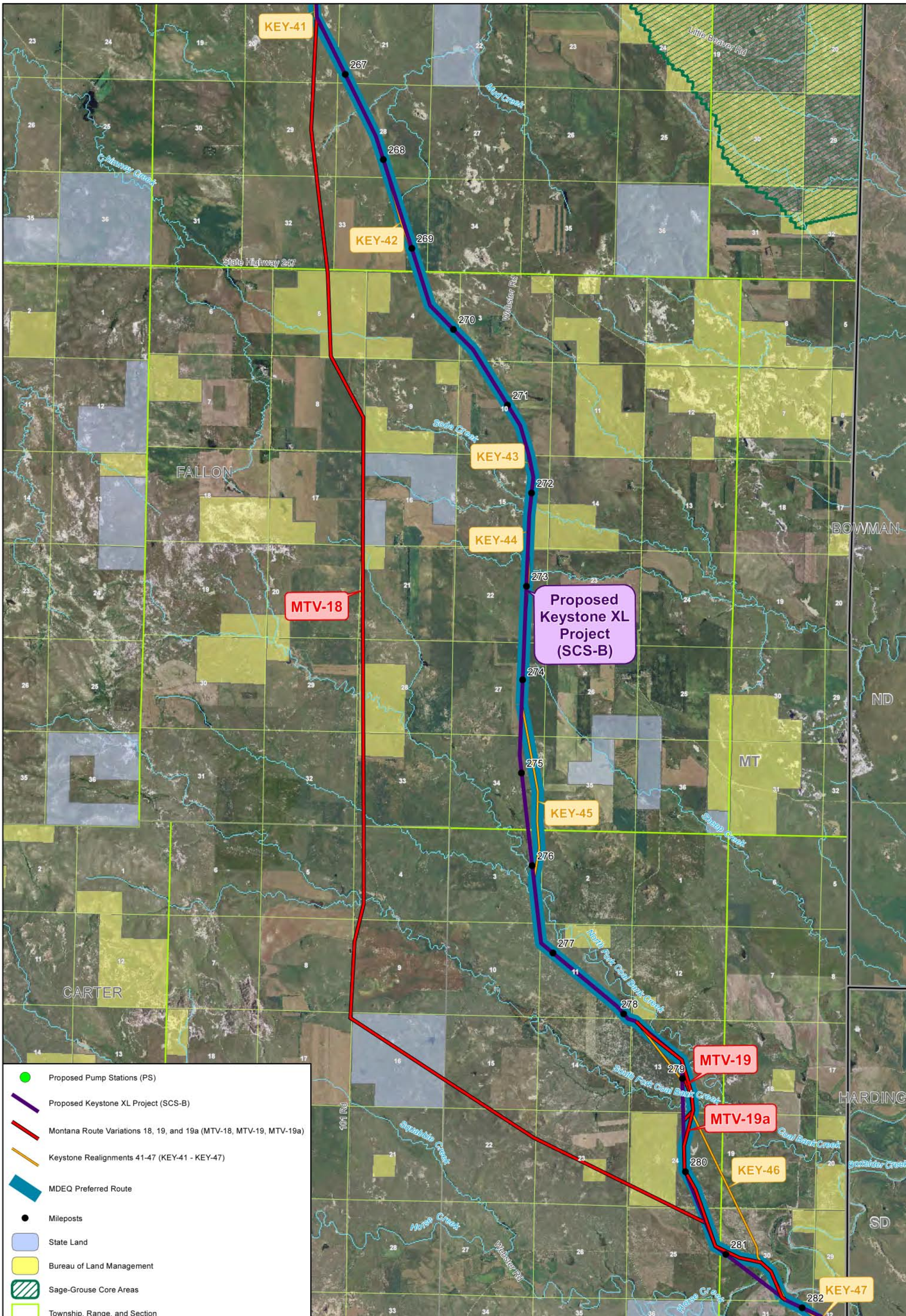
0 0.25 0.5 1 Miles

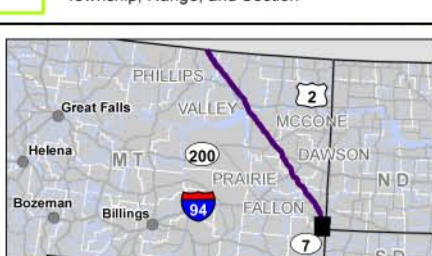
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-13

**Montana Route Variations 16 and 17 (MTV-16, MTV-17)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

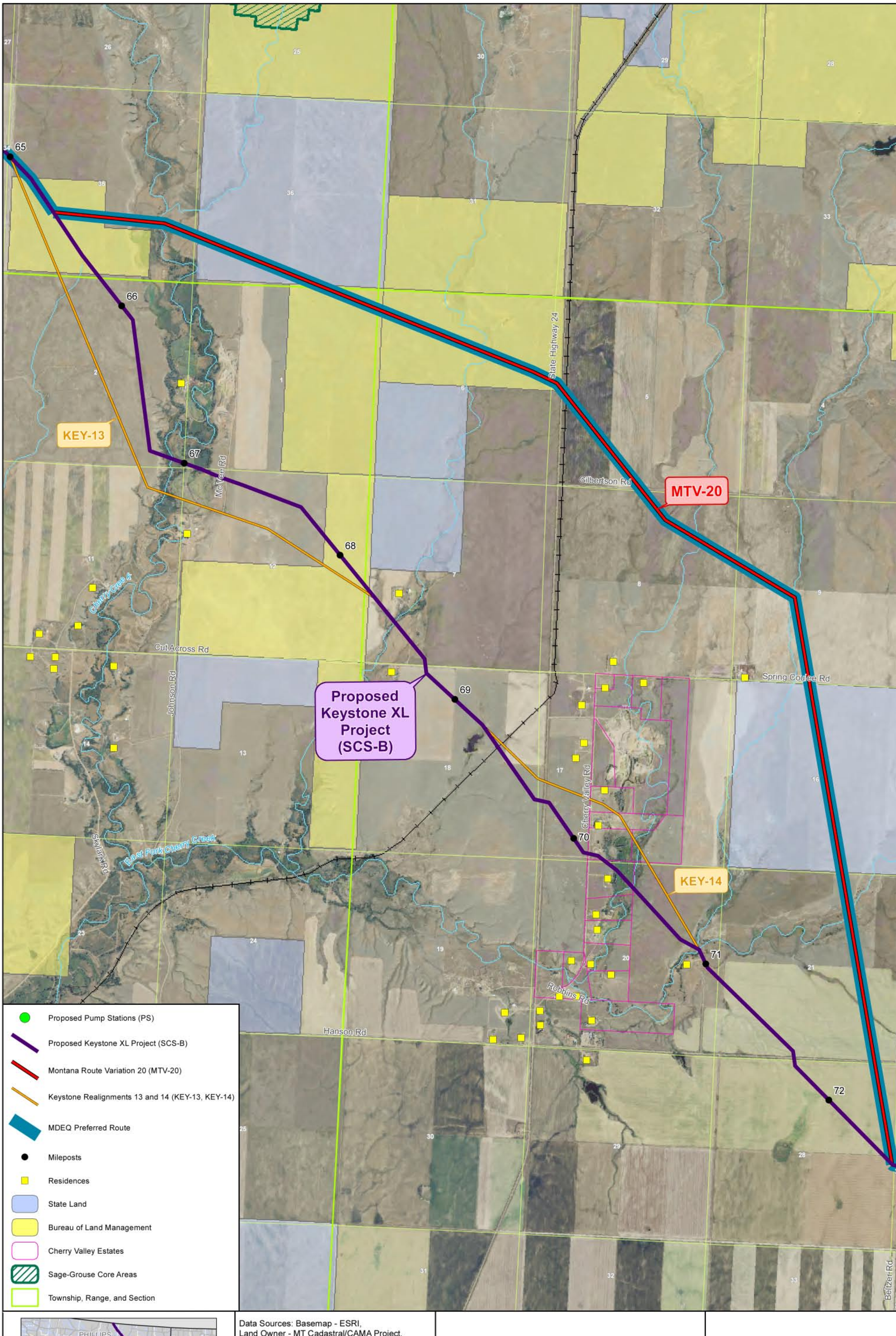
0 0.25 0.5 1 Miles

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-14

**Montana Route Variations 18, 19, and 19a (MTV-18, MTV-19, MTV-19a)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

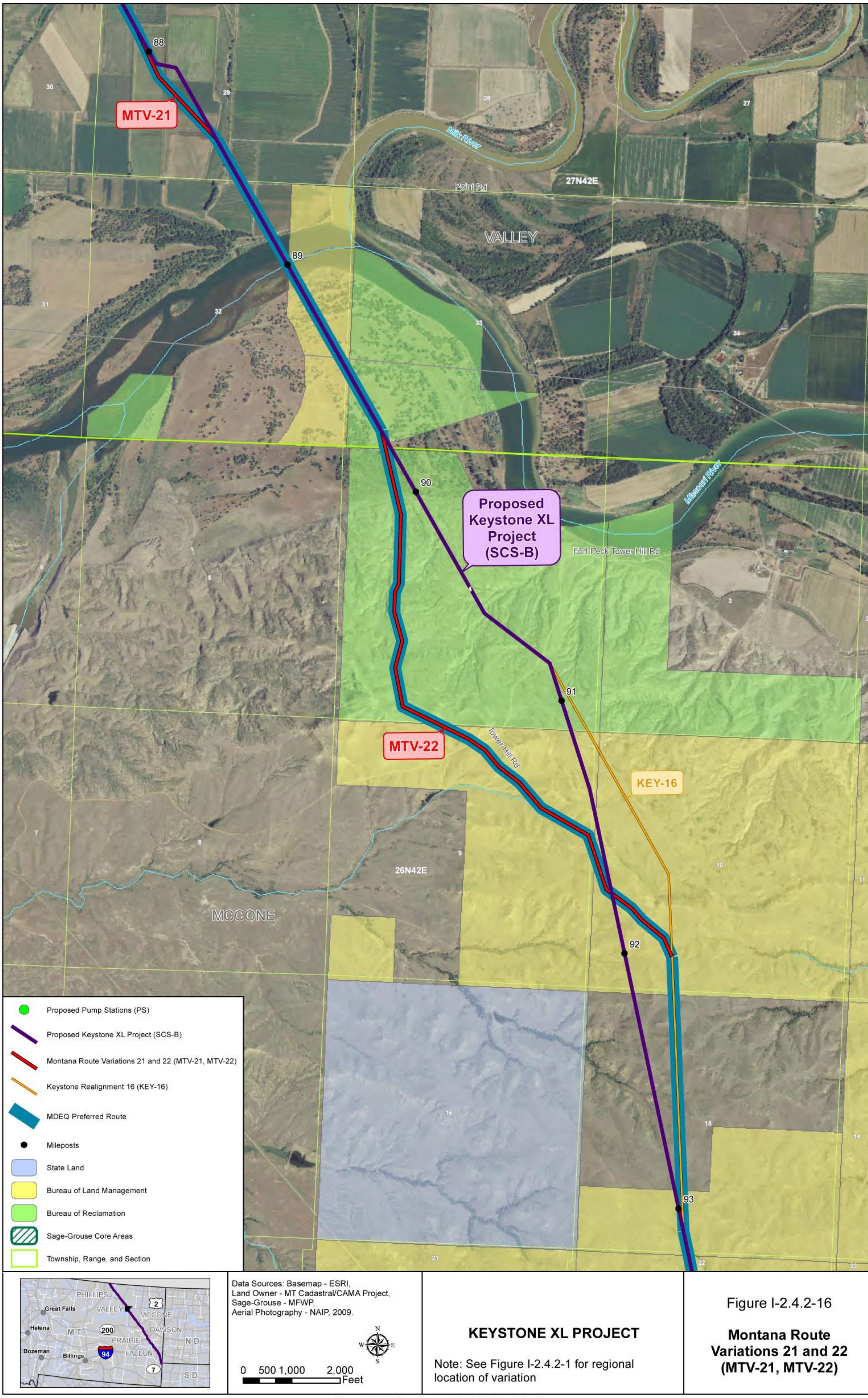
0 750 1,500 3,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-15

**Montana Route Variation 20 (MTV-20)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-16

**Montana Route Variations 21 and 22 (MTV-21, MTV-22)**



Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

0 250 500 1,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-17

**Montana Route Variation 23 (MTV-23)**


Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

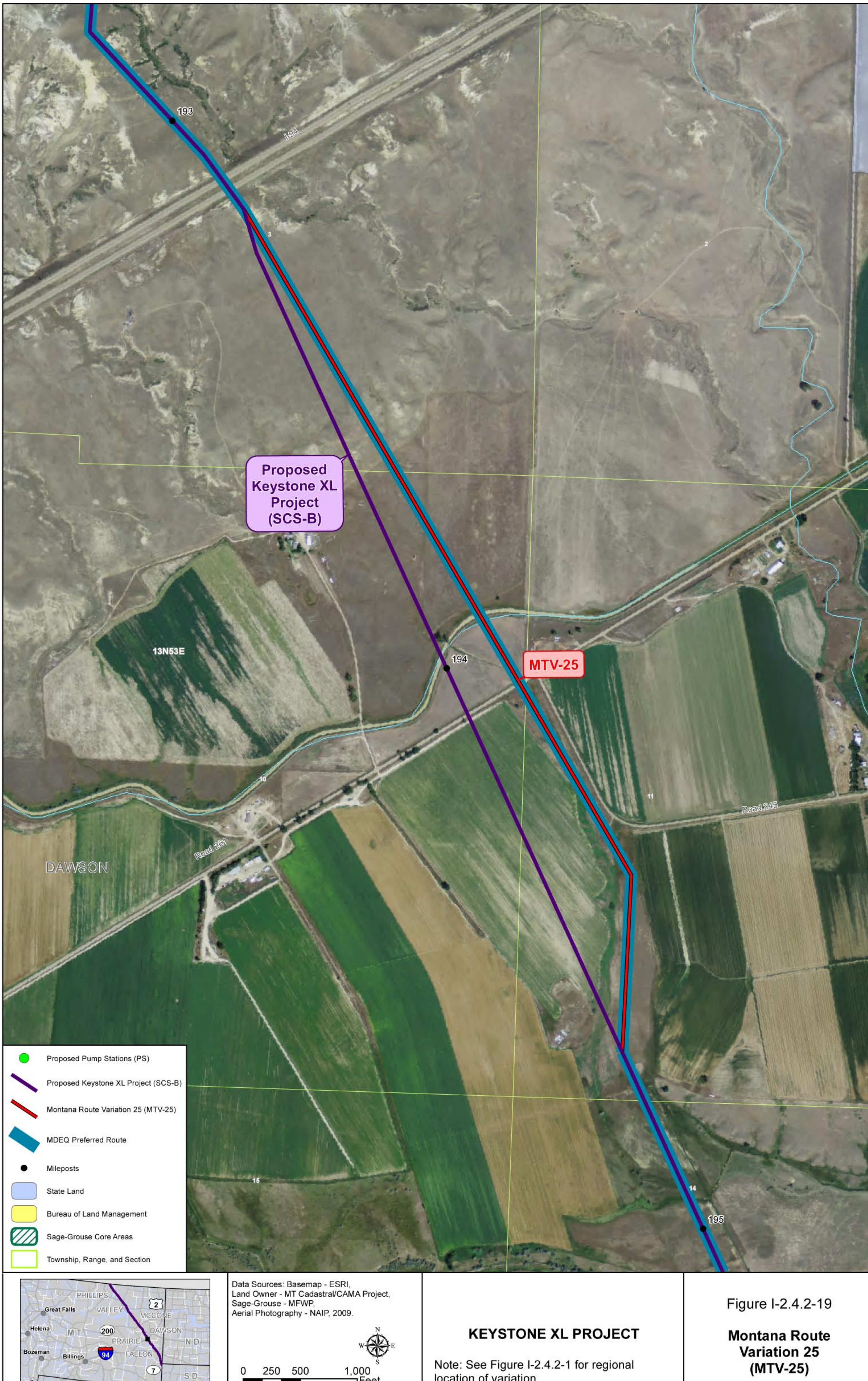
0 375 750 1,500 Feet

KEYSTONE XL PROJECT

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-18

**Montana Route Variation 24 (MTV-24)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-19

**Montana Route Variation 25 (MTV-25)**



Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

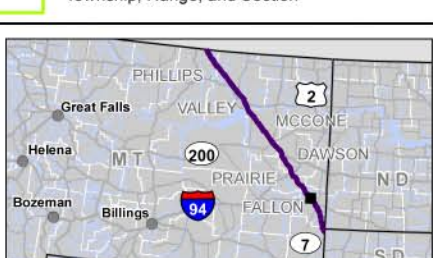
0 150 300 600 Feet

**KEYSTONE XL PROJECT**

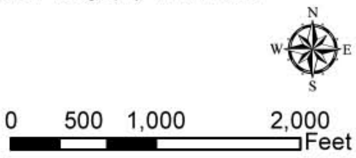
Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-20

**Montana Route Variation 26 (MTV-26)**


Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

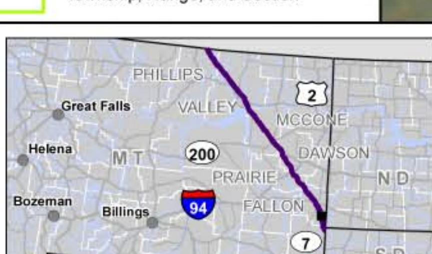



**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-21

**Montana Route Variation 27 (MTV-27)**


Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

0 50 100 200 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-22

**Montana Route Variation 28 (MTV-28)**



Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

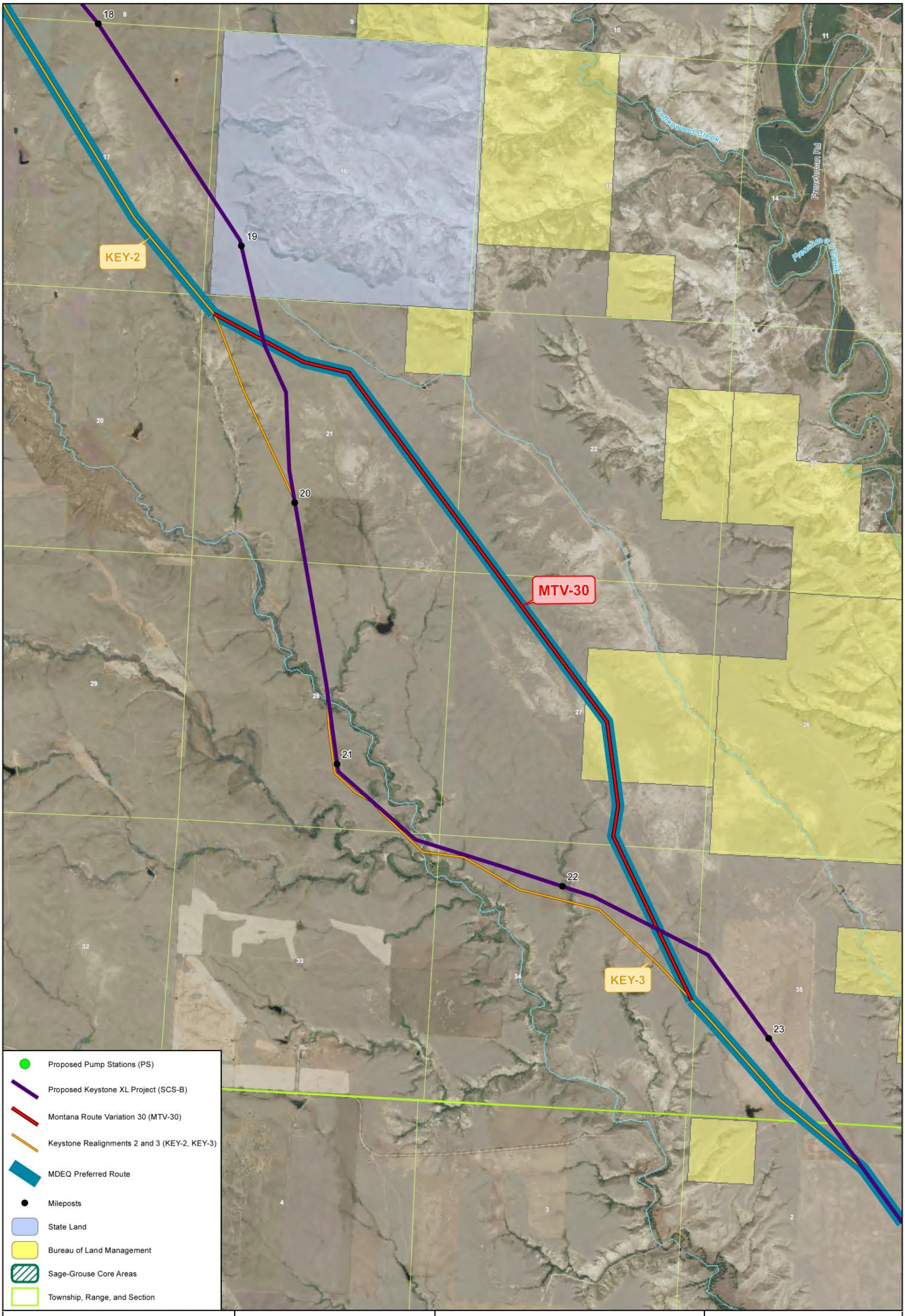
0 250 500 1,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-23

**Montana Route Variation 29 (MTV-29)**



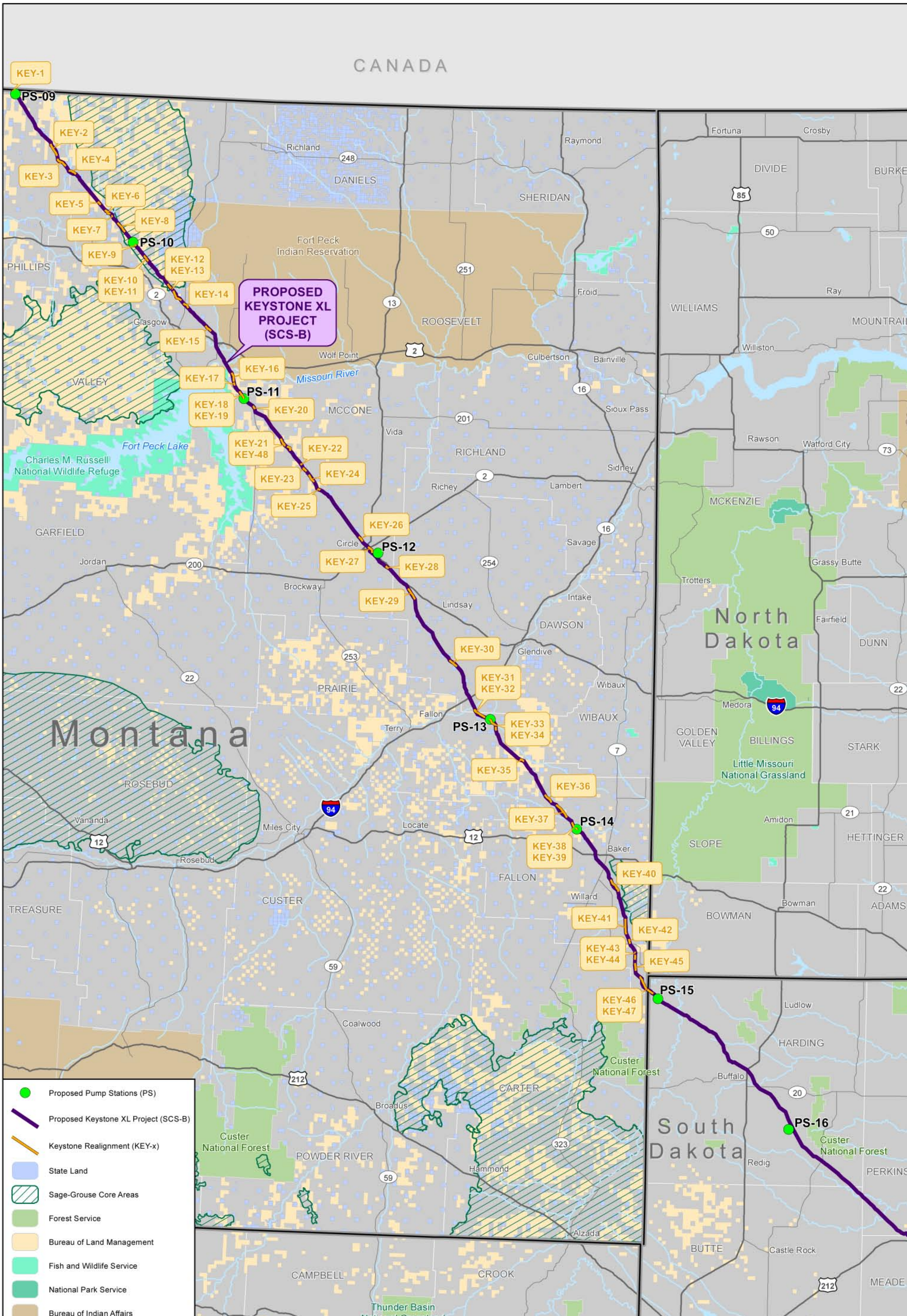

Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.2-1 for regional location of variation

Figure I-2.4.2-24

**Montana Route Variation 30 (MTV-30)**




Data Sources: Federal Lands, Basemap - ESRI,
Sage-Grouse - MFWP,
State Land - MT Cadastral/CAMA Project.

0 5 10 20 Miles

**KEYSTONE XL PROJECT**

Note: See Figures I-2.4.3-2 through I-2.4.3-24 for additional details

Figure I-2.4.3-1

Keystone Realignments

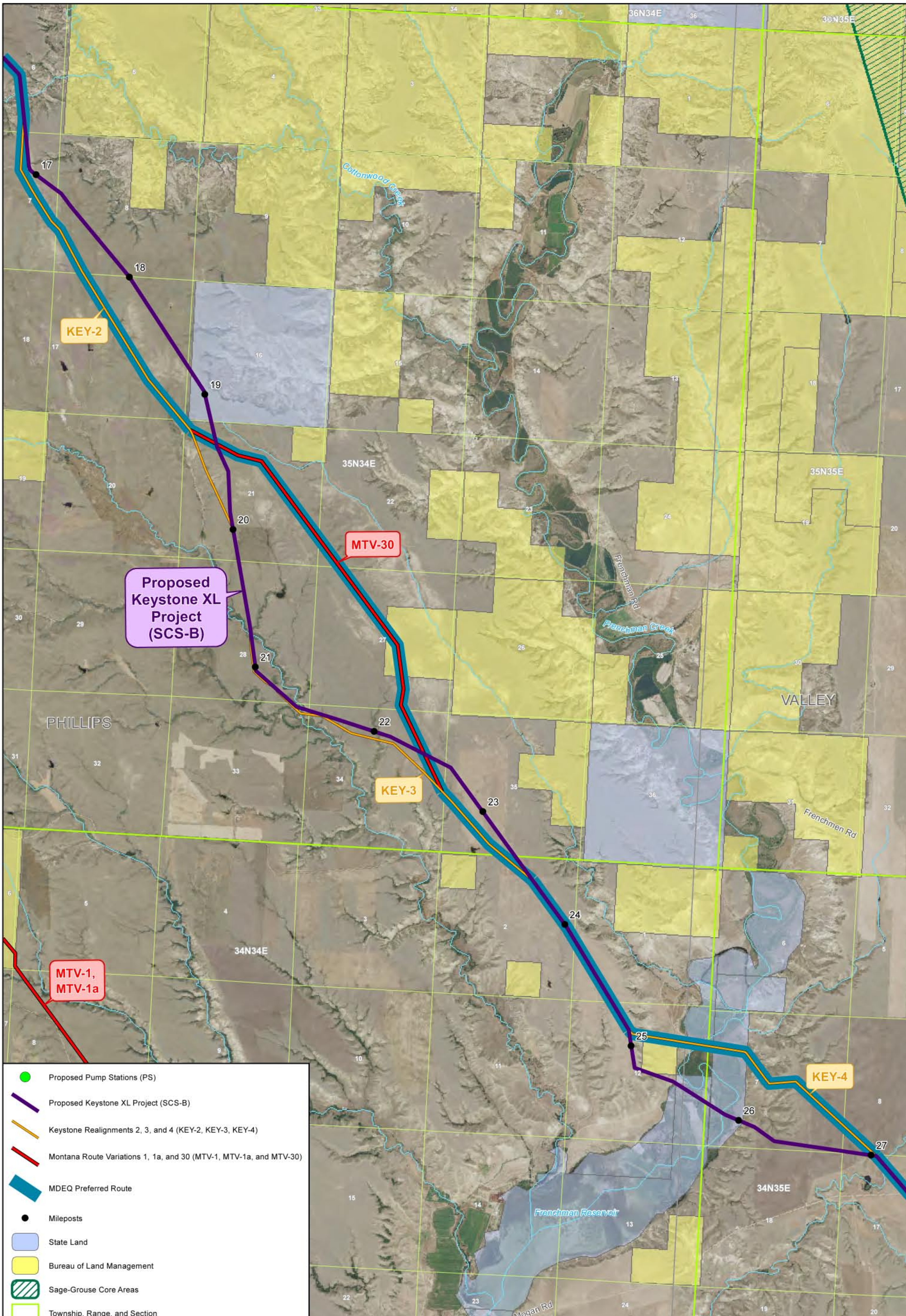

Data Sources: Basemap - ESRI, Land Owner - MT Cadastral/CAMA Project, Sage-Grouse - MFWP, Aerial Photography - NAIP, 2009.

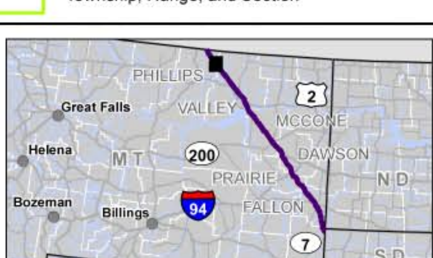
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-2

**Keystone Realignment 1 (KEY-1)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

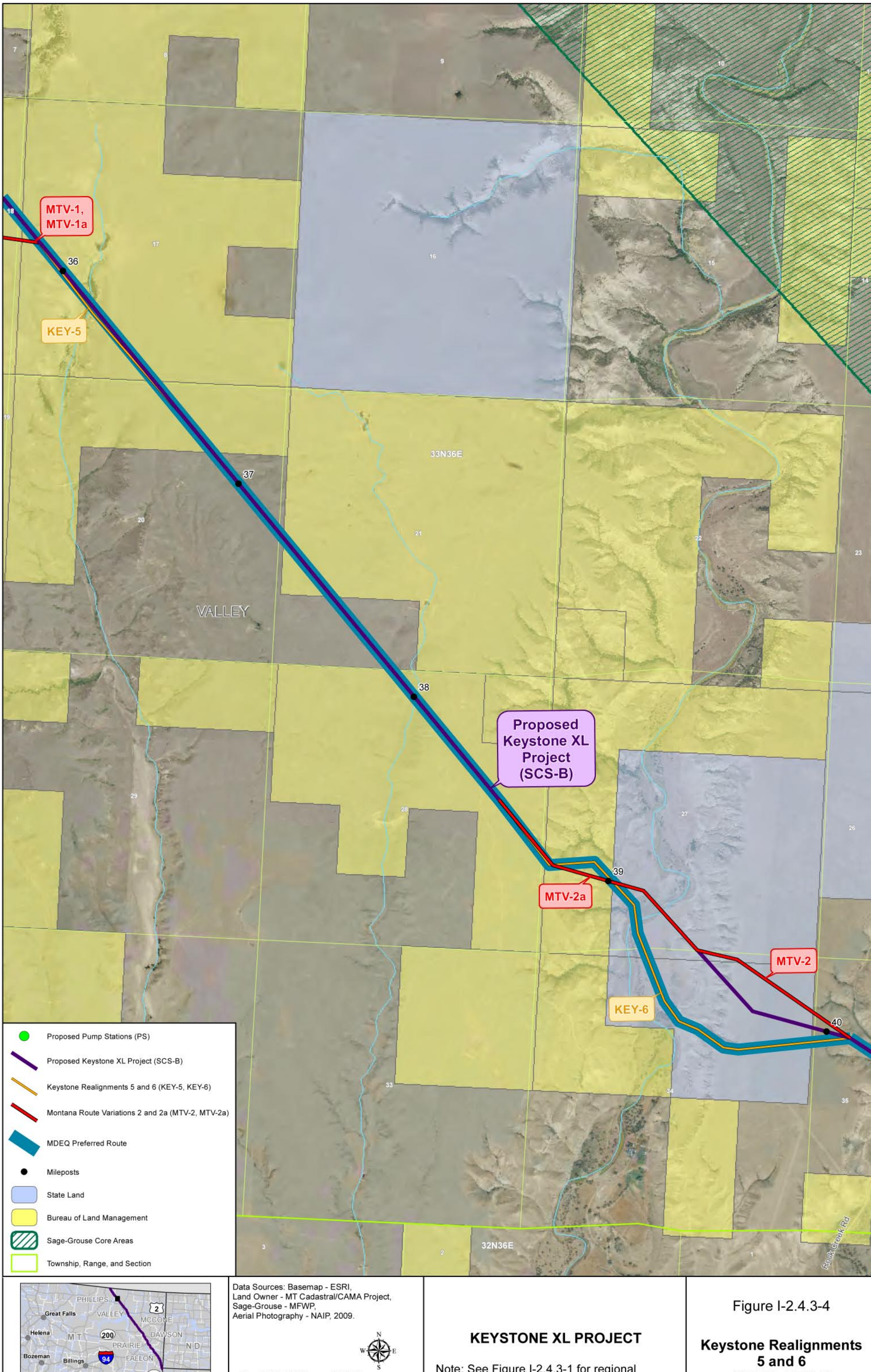
0 1,250 2,500 5,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-3

**Keystone Realignments 2, 3, and 4 (KEY-2, KEY-3, KEY-4)**



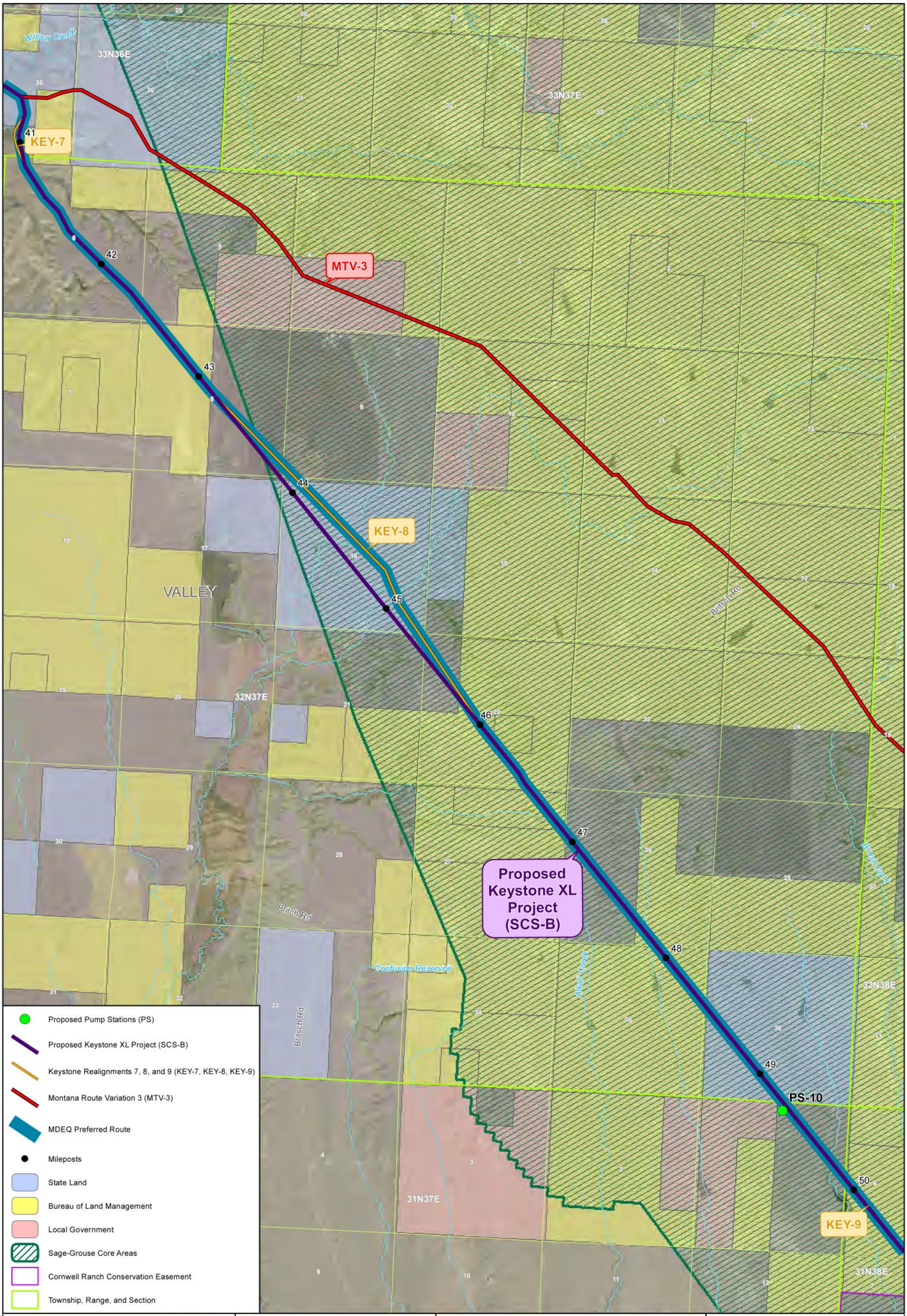

Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-4

**Keystone Realignments 5 and 6 (KEY-5, KEY-6)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009,
Cornwell Ranch Conservation Easement - NC.

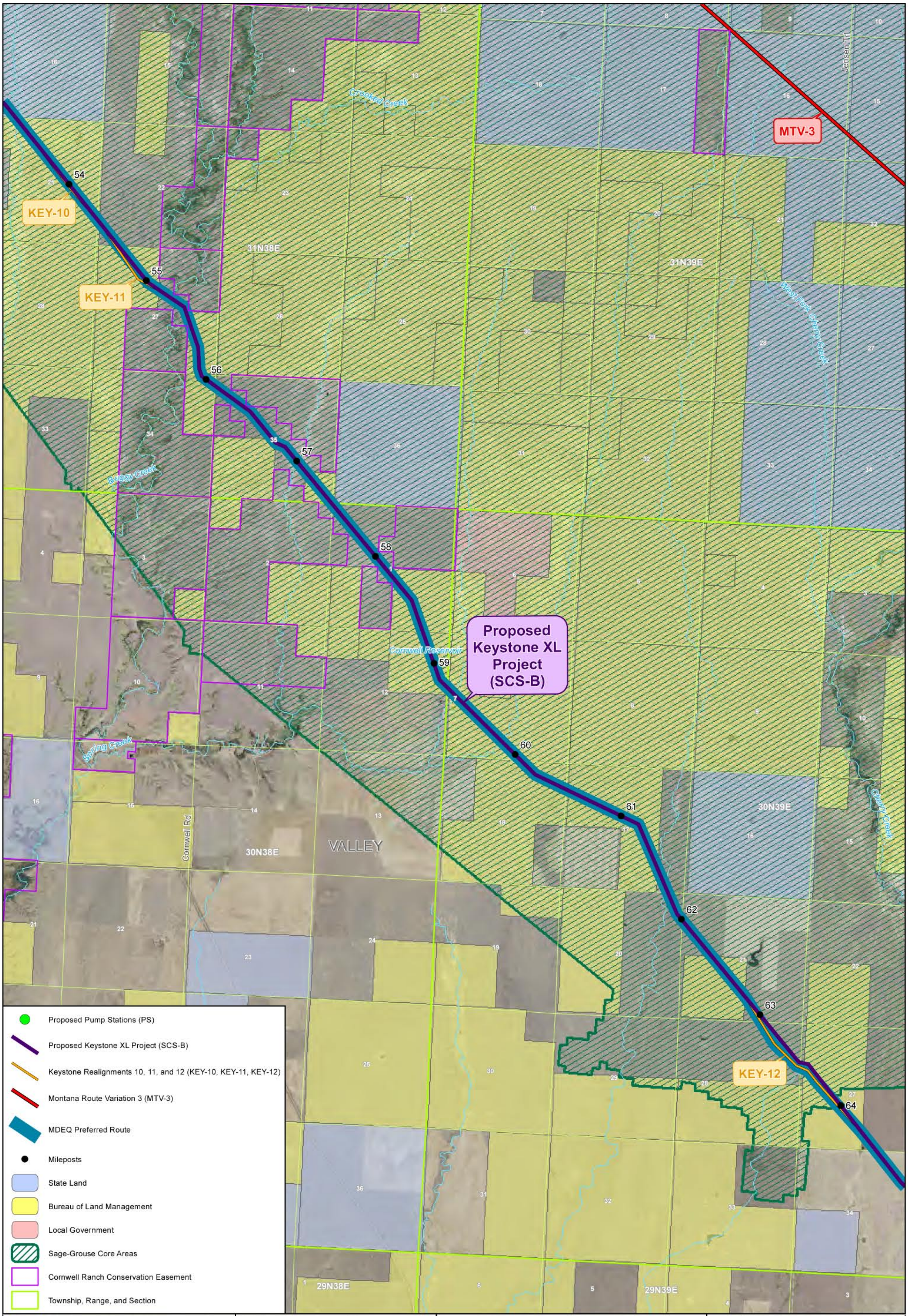
0 1,000 2,000 4,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-5

**Keystone Realignments 7, 8, and 9 (KEY-7, KEY-8, KEY-9)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009,
Cornwell Ranch Conservation Easement - NC.

0 1,500 3,000 6,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-6

**Keystone Realignments 10, 11, and 12 (KEY-10, KEY-11, KEY-12)**


Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-7

**Keystone Realignments 13 and 14 (KEY-13, KEY-14)**

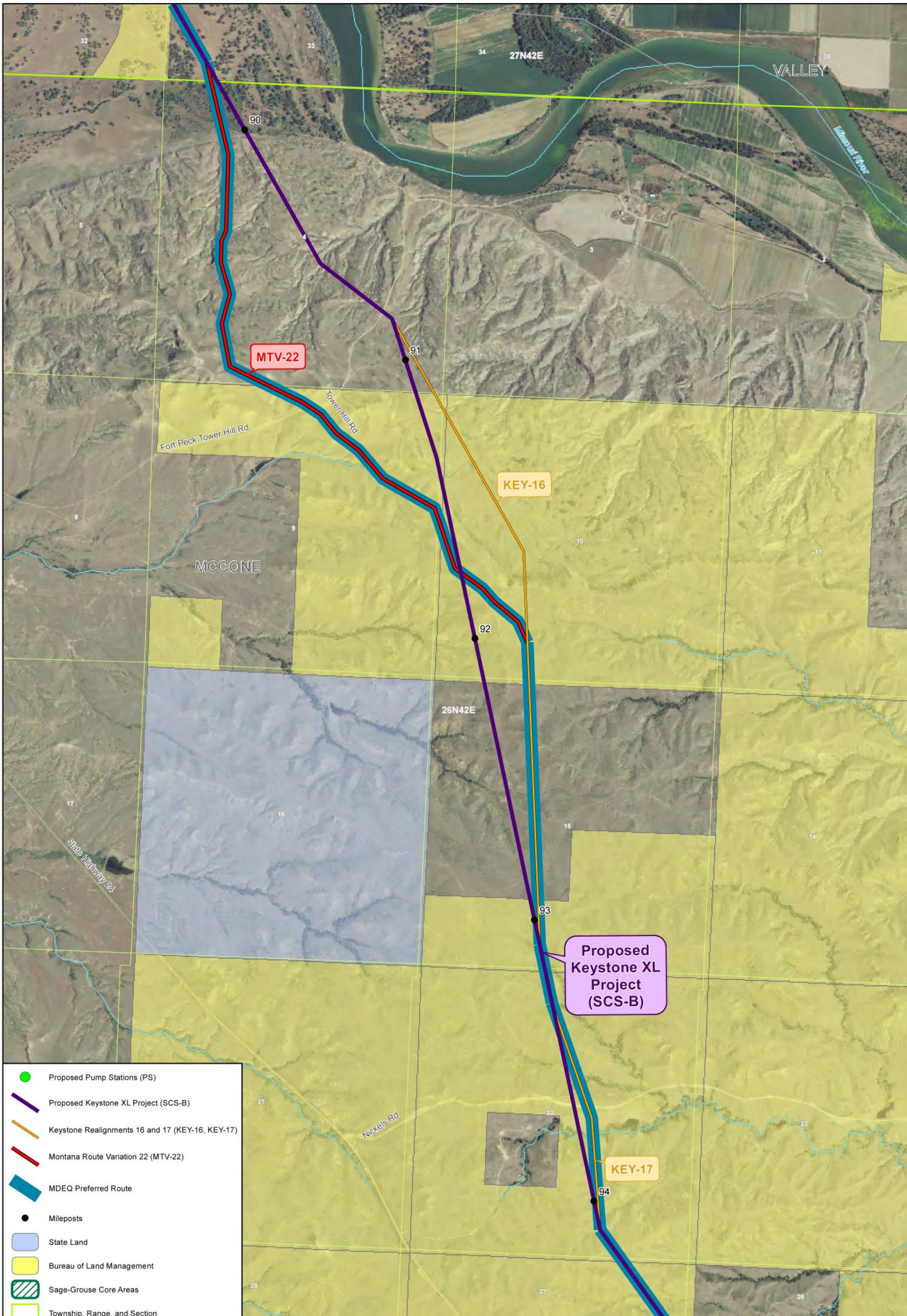

Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

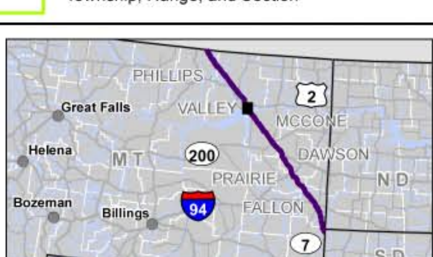
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-8

**Keystone Realignment 15 (KEY-15)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

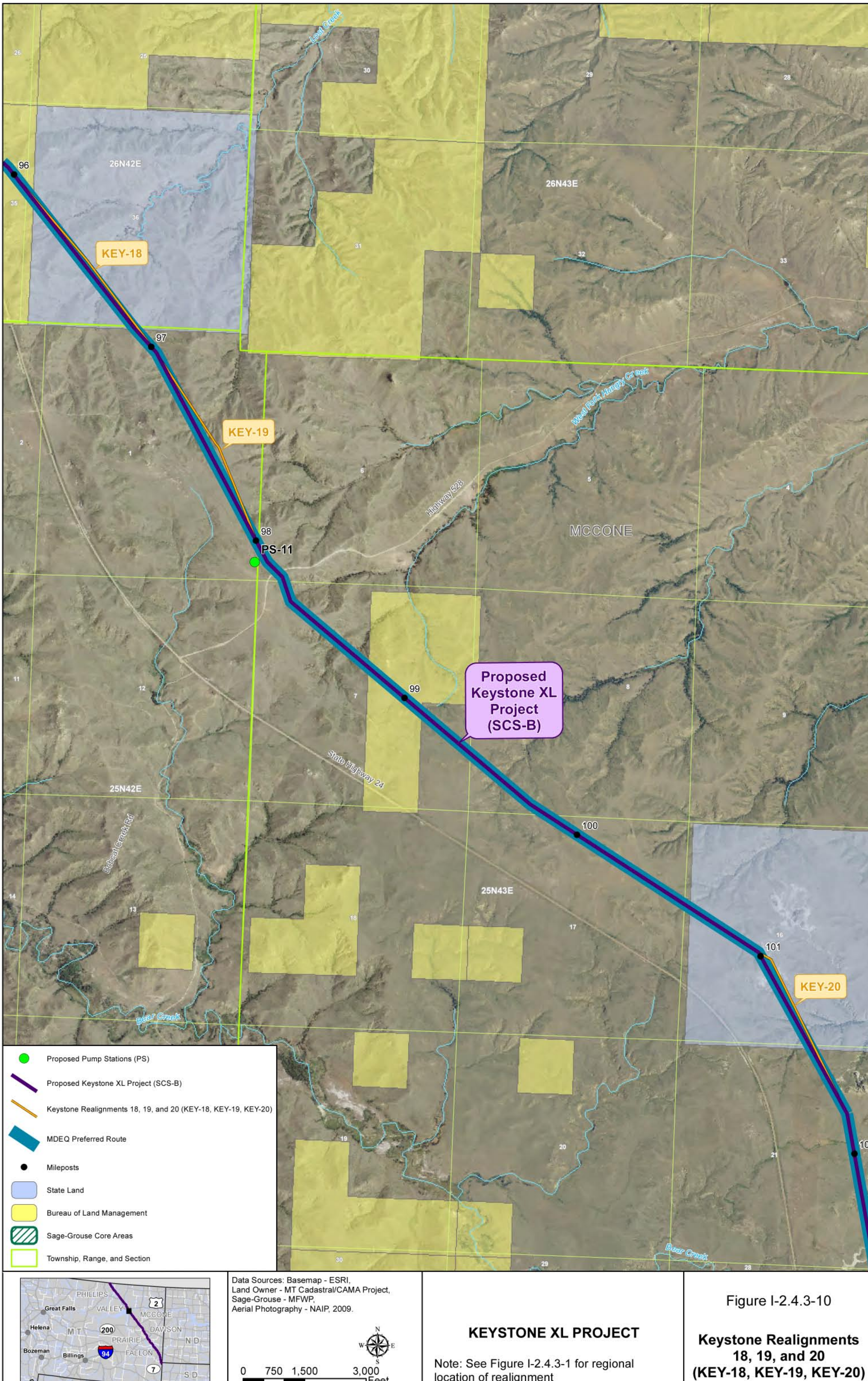
0 500 1,000 2,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-9

**Keystone Realignments 16 and 17 (KEY-16, KEY-17)**



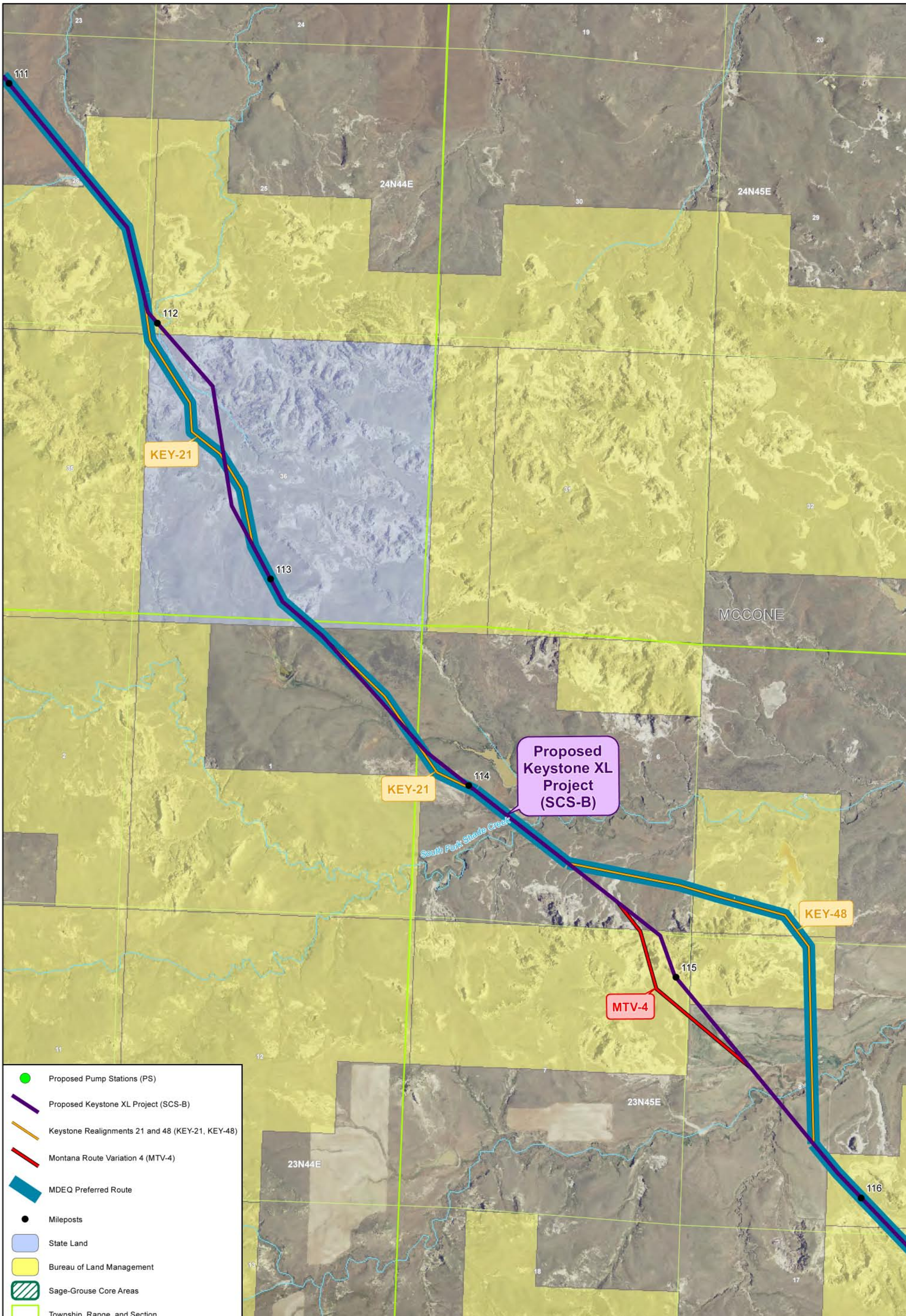

Data Sources: Basemap - ESRI, Land Owner - MT Cadastral/CAMA Project, Sage-Grouse - MFWP, Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-10

**Keystone Realignments 18, 19, and 20 (KEY-18, KEY-19, KEY-20)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

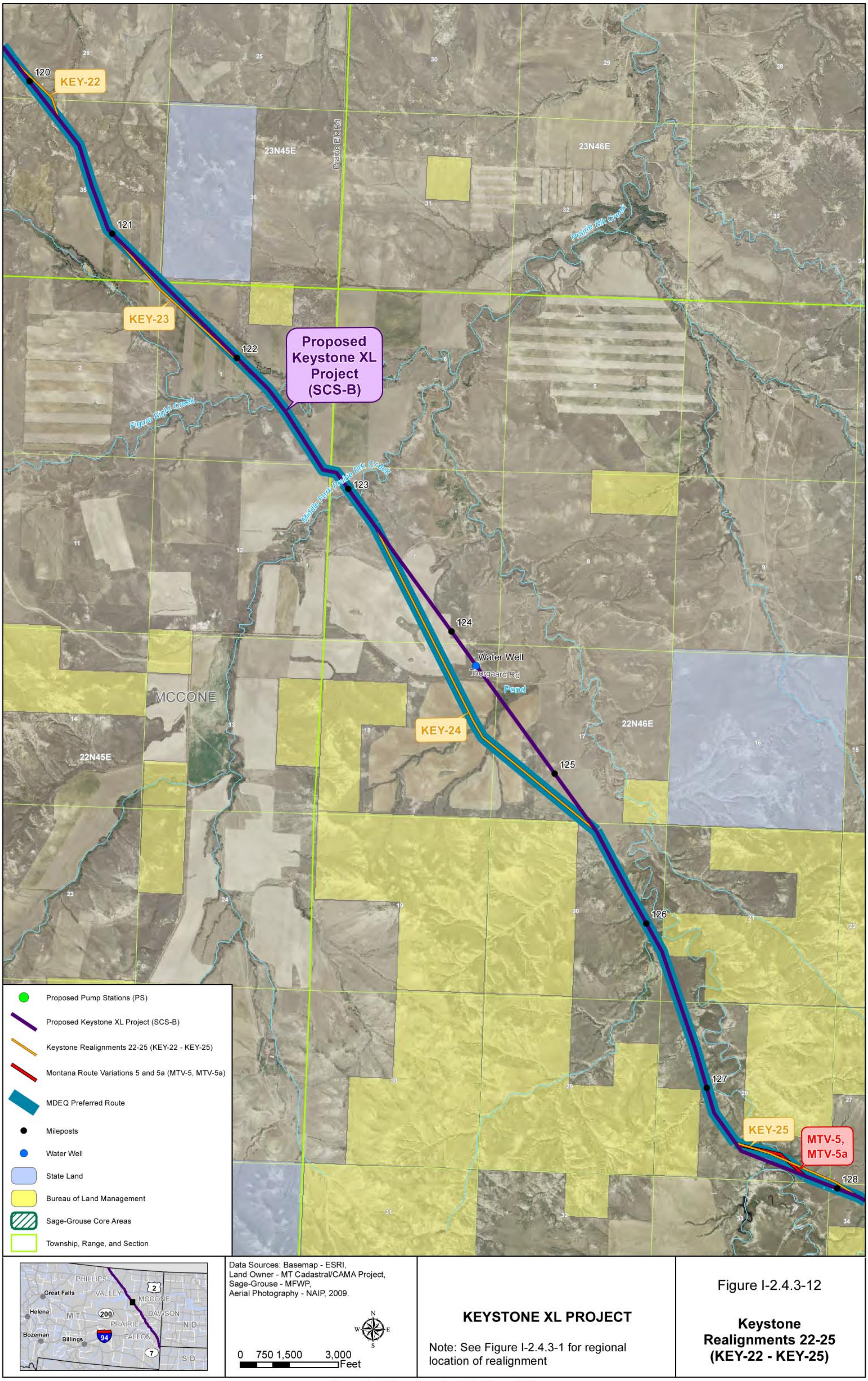
0 500 1,000 2,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-11

**Keystone Realignments 21 and 48 (KEY-21, KEY-48)**



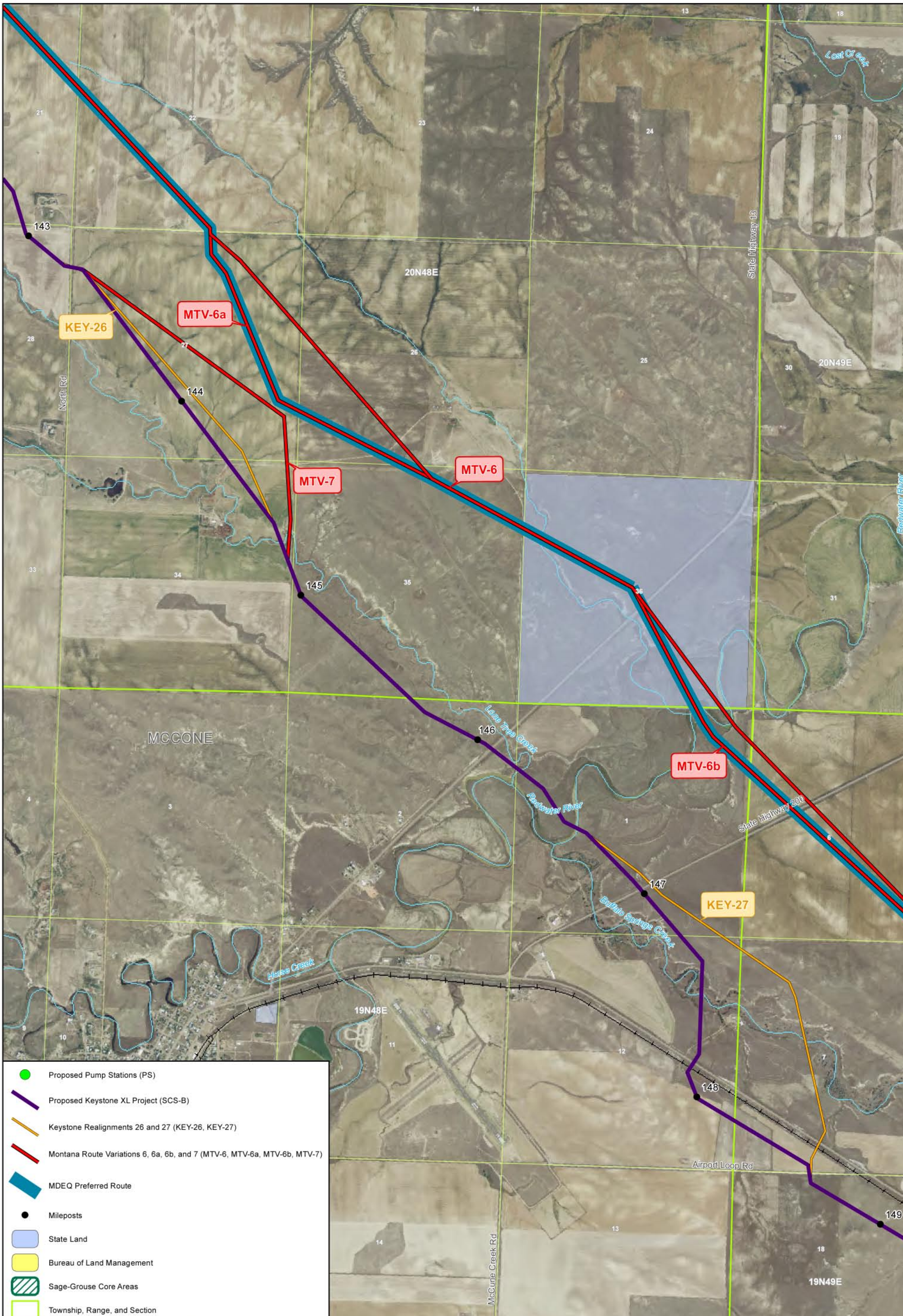

Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-12

**Keystone Realignments 22-25 (KEY-22 - KEY-25)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

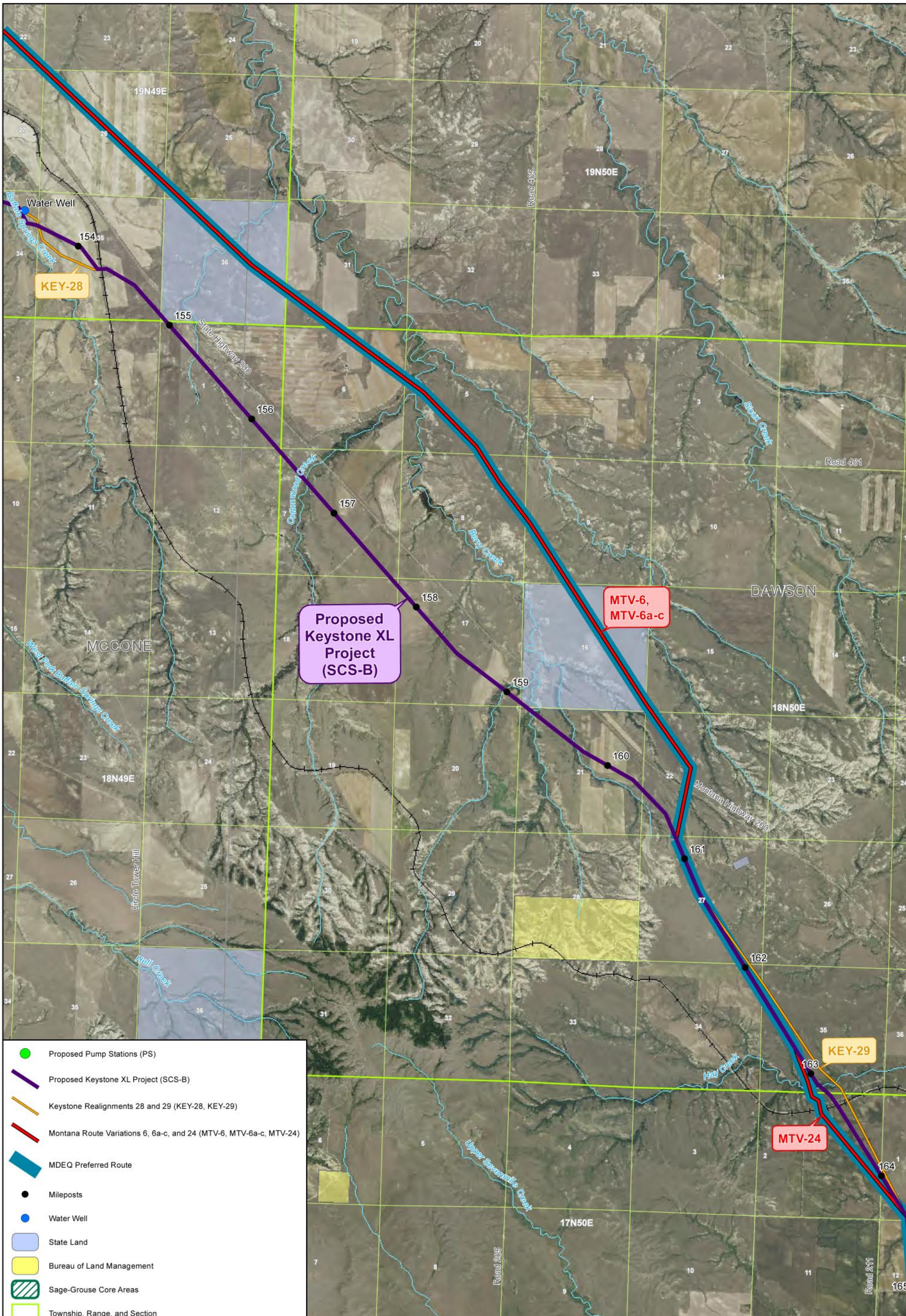
0 750 1,500 3,000 Feet

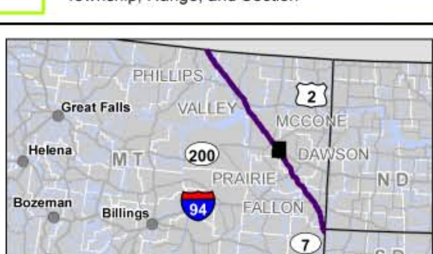
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-13

**Keystone Realignments 26 and 27 (KEY-26, KEY-27)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

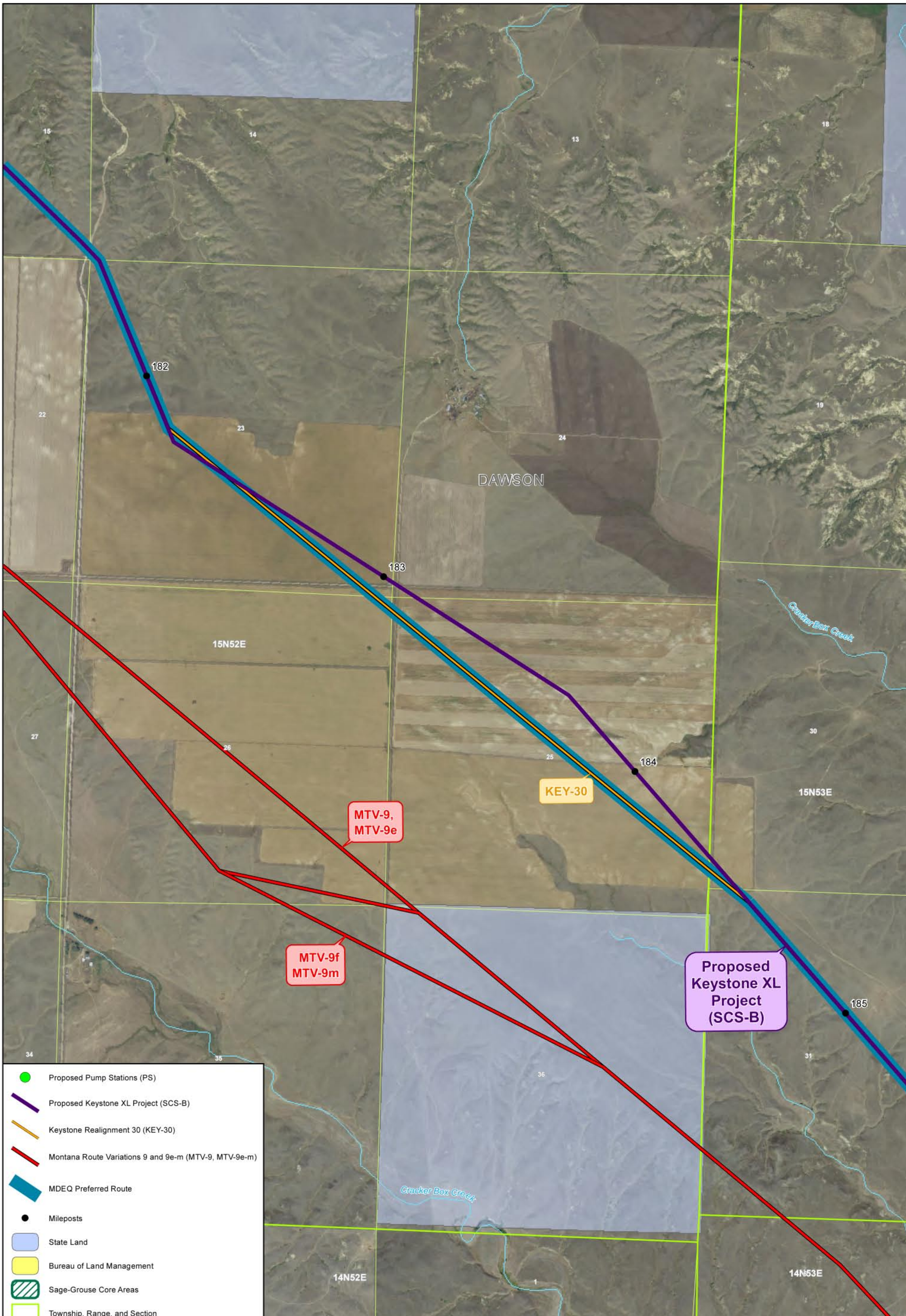
0 1,250 2,500 5,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-14

**Keystone Realignments 28 and 29 (KEY-28, KEY-29)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

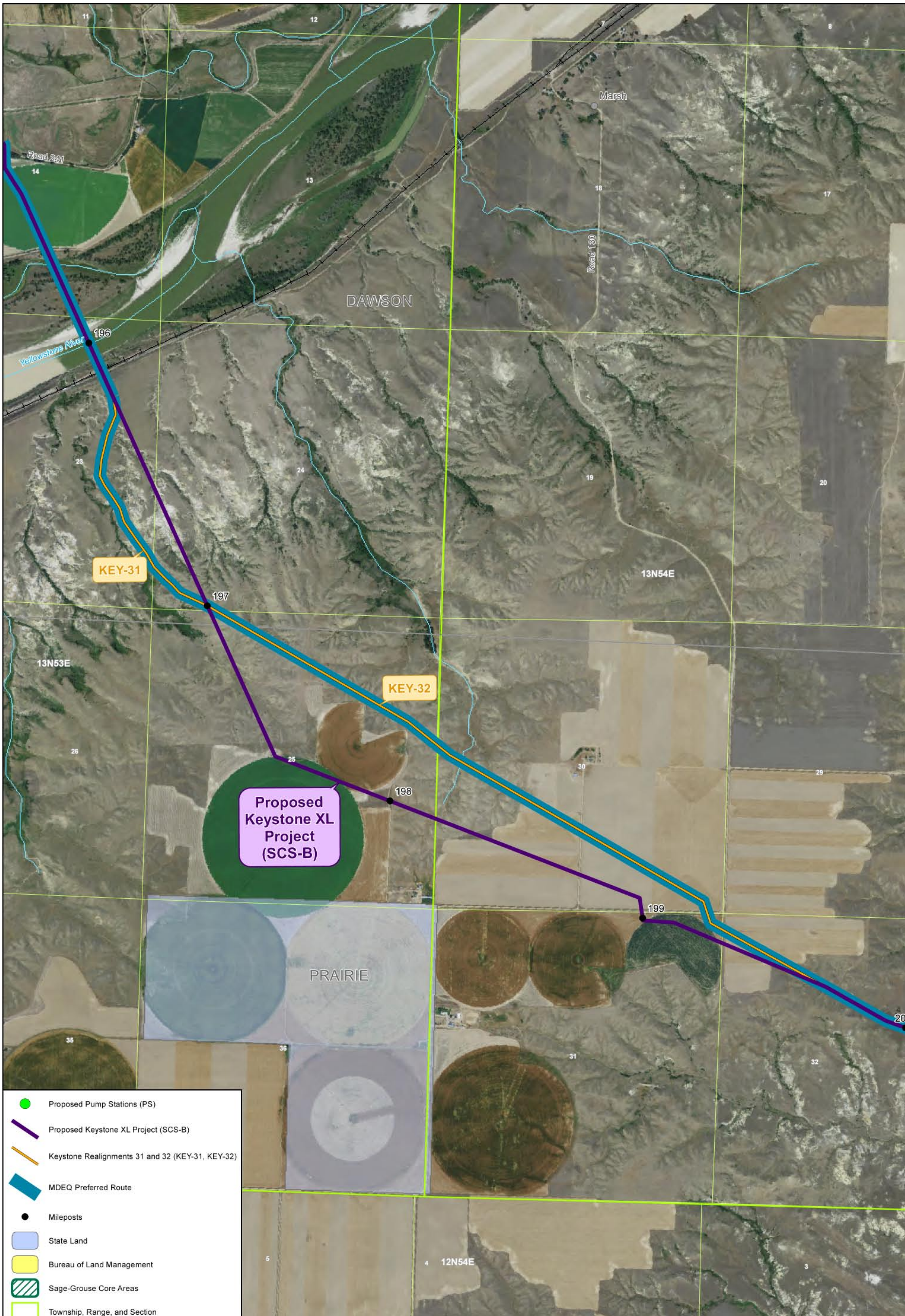
0 500 1,000 2,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-15

**Keystone Realignment 30 (KEY-30)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

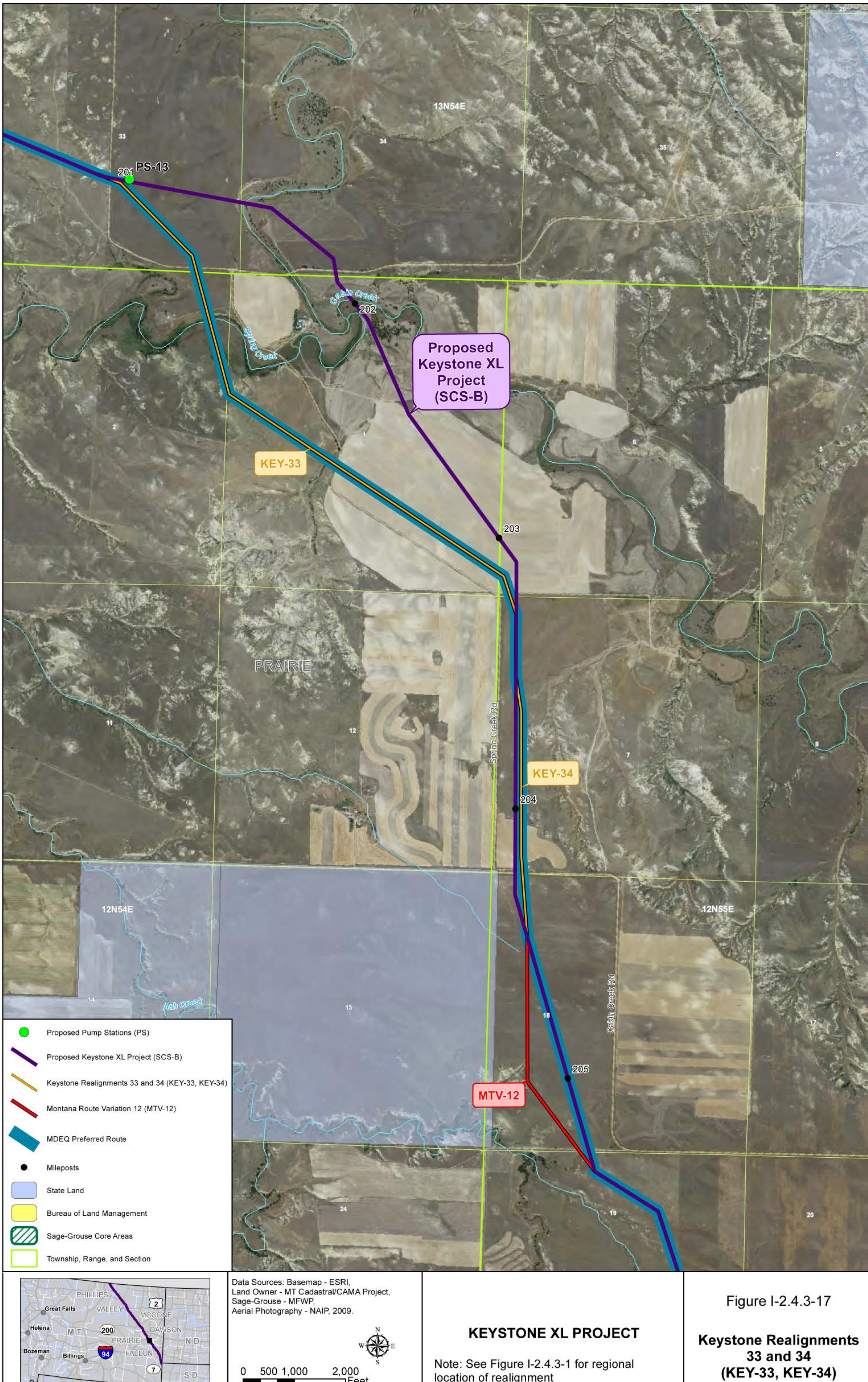
0 500 1,000 2,000
Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-16

**Keystone Realignments 31 and 32 (KEY-31, KEY-32)**




Data Sources: Basemap - ESRI, Land Owner - MT Cadastral/CAMA Project, Sage-Grouse - MFWP, Aerial Photography - NAIP, 2009.

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-17

**Keystone Realignments 33 and 34 (KEY-33, KEY-34)**



Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

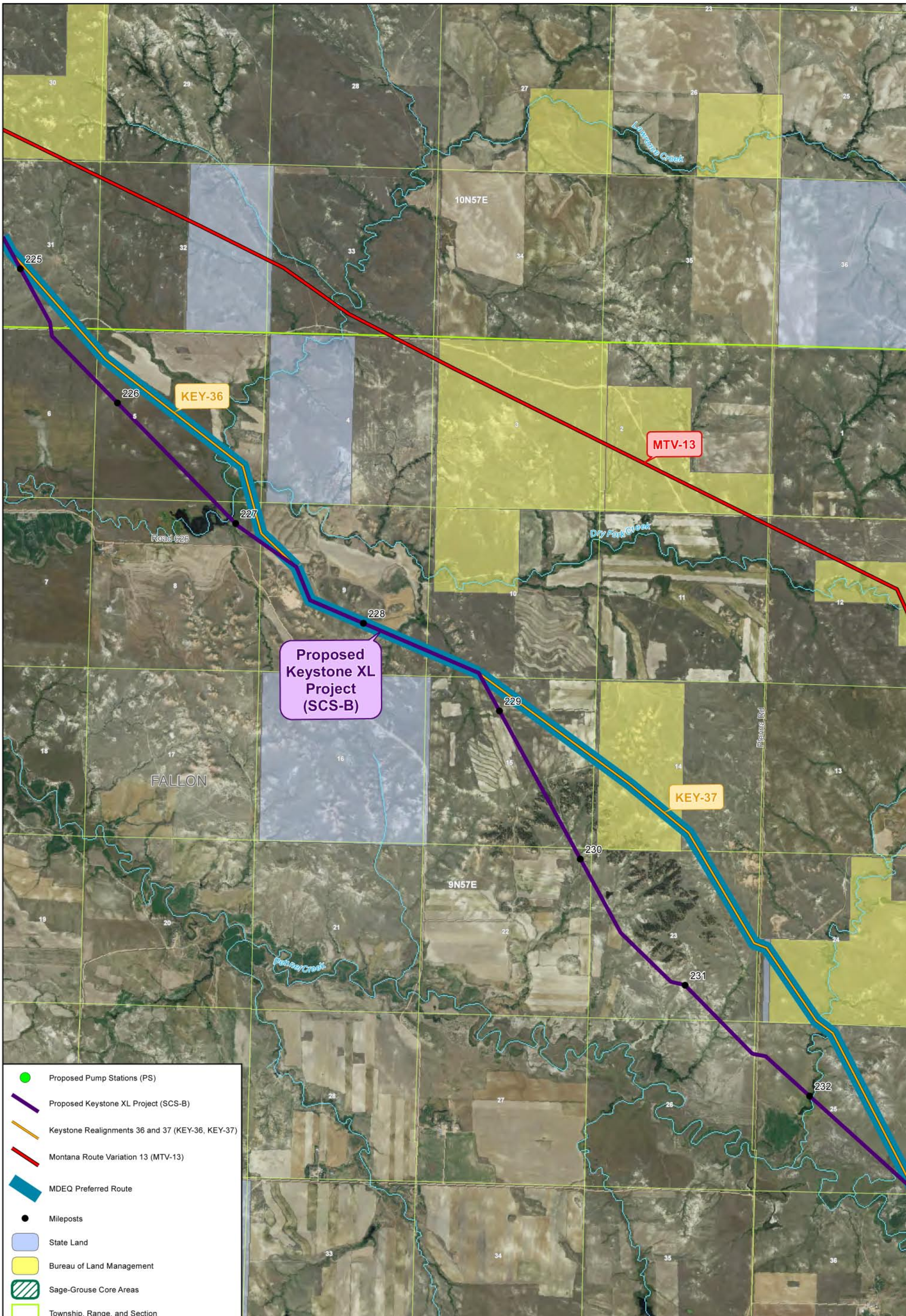
0 250 500 1,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-18

**Keystone Realignment 35 (KEY-35)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

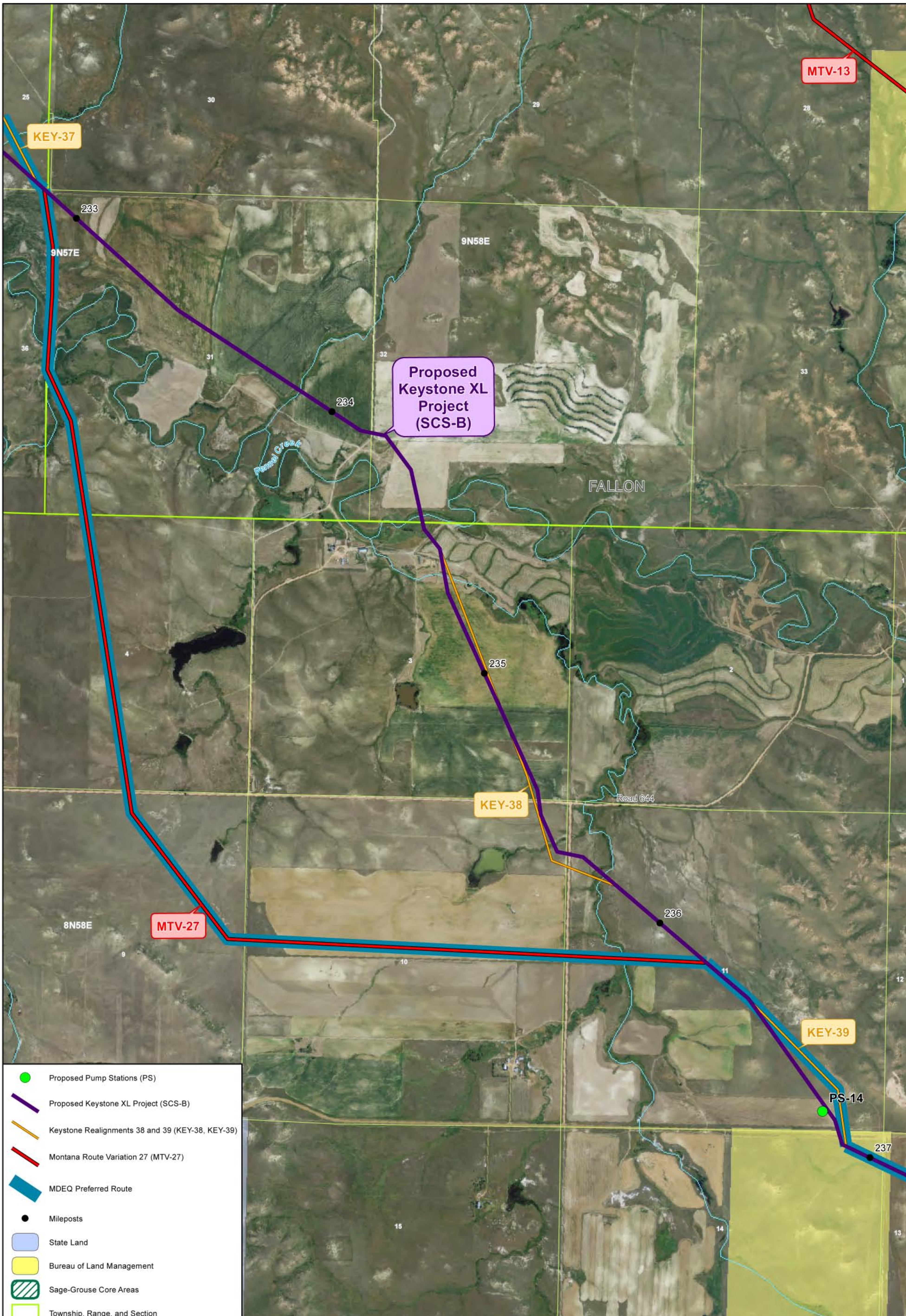
0 1,000 2,000 4,000 Feet

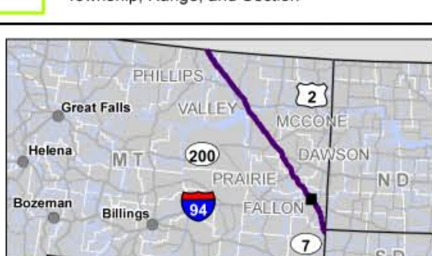
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-19

**Keystone Realignments 36 and 37 (KEY-36, KEY-37)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

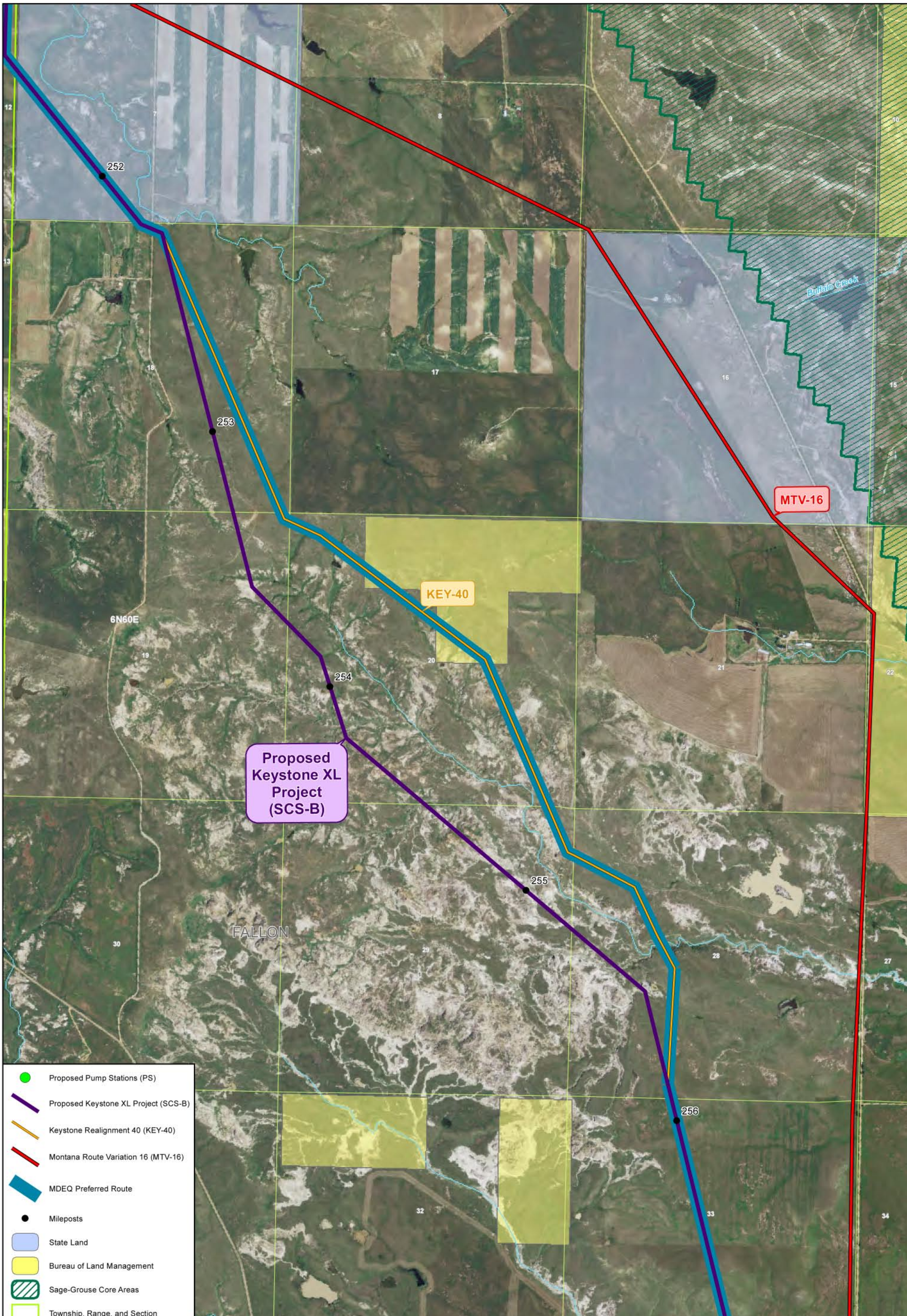
0 500 1,000 2,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-20

**Keystone Realignments 38 and 39 (KEY-38, KEY-39)**





Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

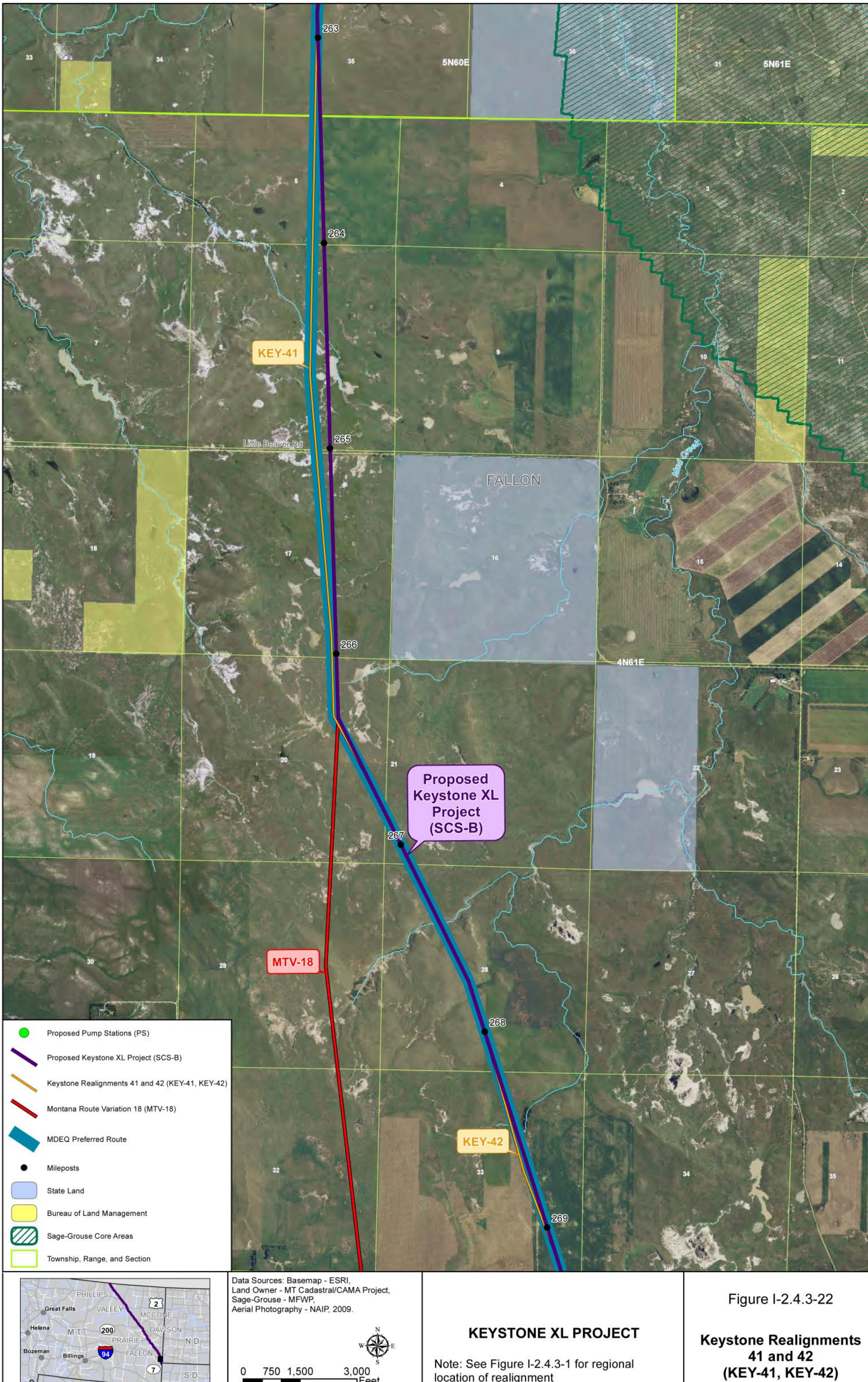
0 500 1,000 2,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-21

**Keystone Realignment 40 (KEY-40)**



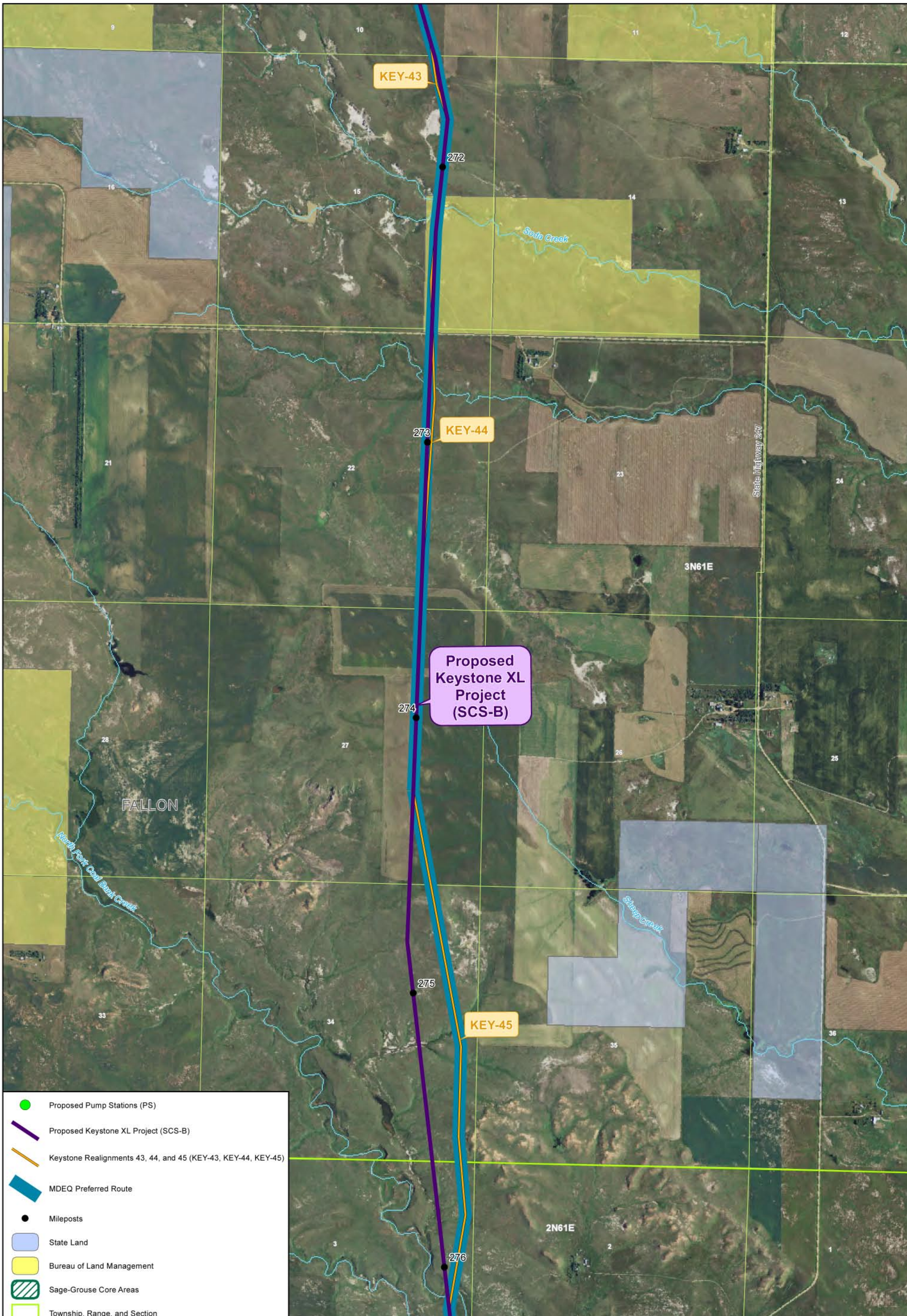

Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

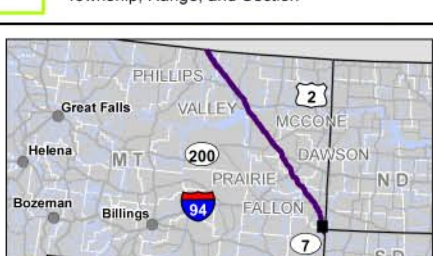
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-22

**Keystone Realignments 41 and 42 (KEY-41, KEY-42)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

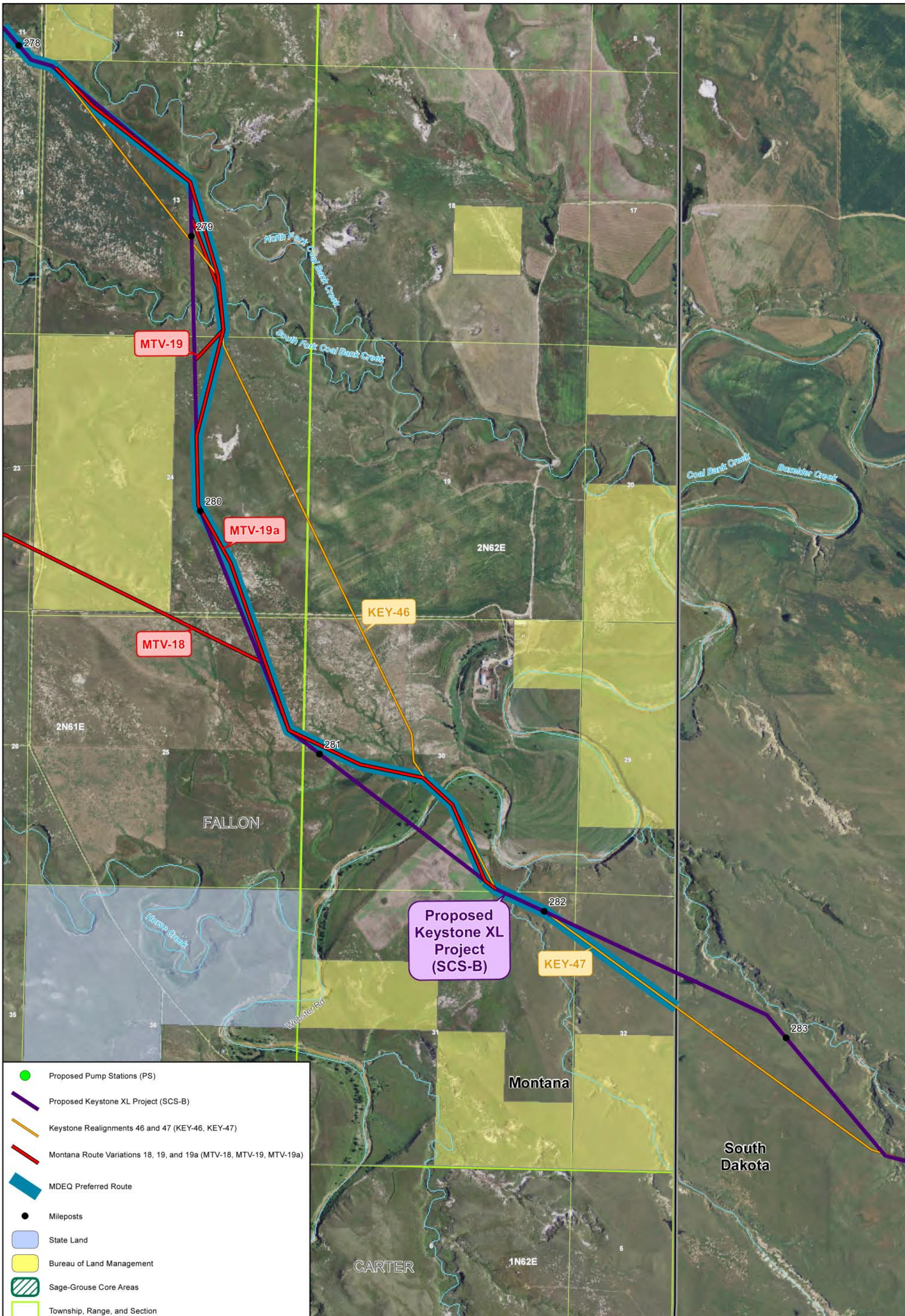
0 500 1,000 2,000 Feet

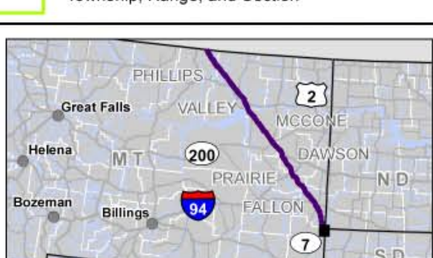
**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-23

**Keystone Realignments 43, 44, and 45 (KEY-43, KEY-44, KEY-45)**




Data Sources: Basemap - ESRI,
Land Owner - MT Cadastral/CAMA Project,
Sage-Grouse - MFWP,
Aerial Photography - NAIP, 2009.

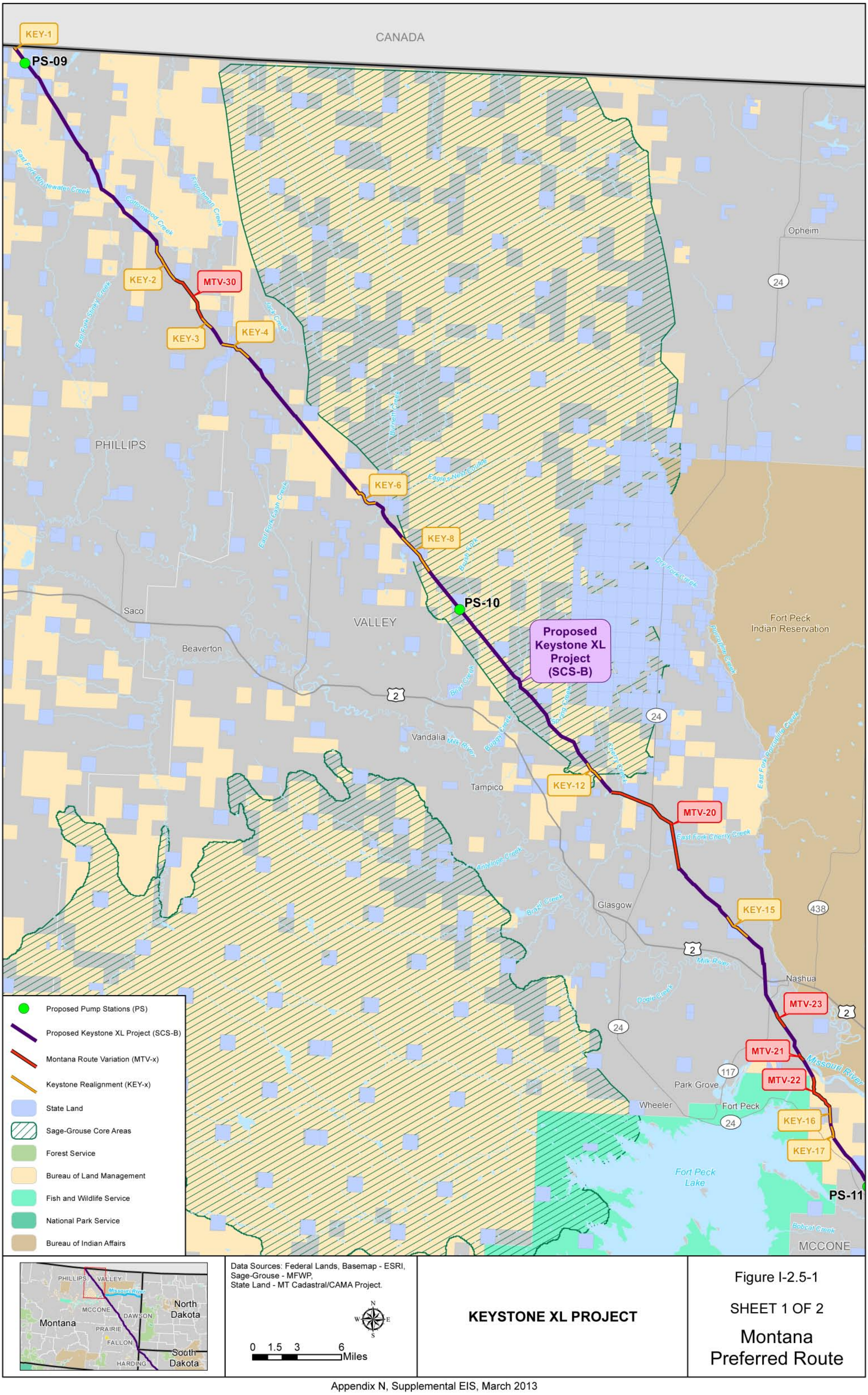
0 500 1,000 2,000 Feet

**KEYSTONE XL PROJECT**

Note: See Figure I-2.4.3-1 for regional location of realignment

Figure I-2.4.3-24

**Keystone Realignments 46 and 47 (KEY-46, KEY-47)**

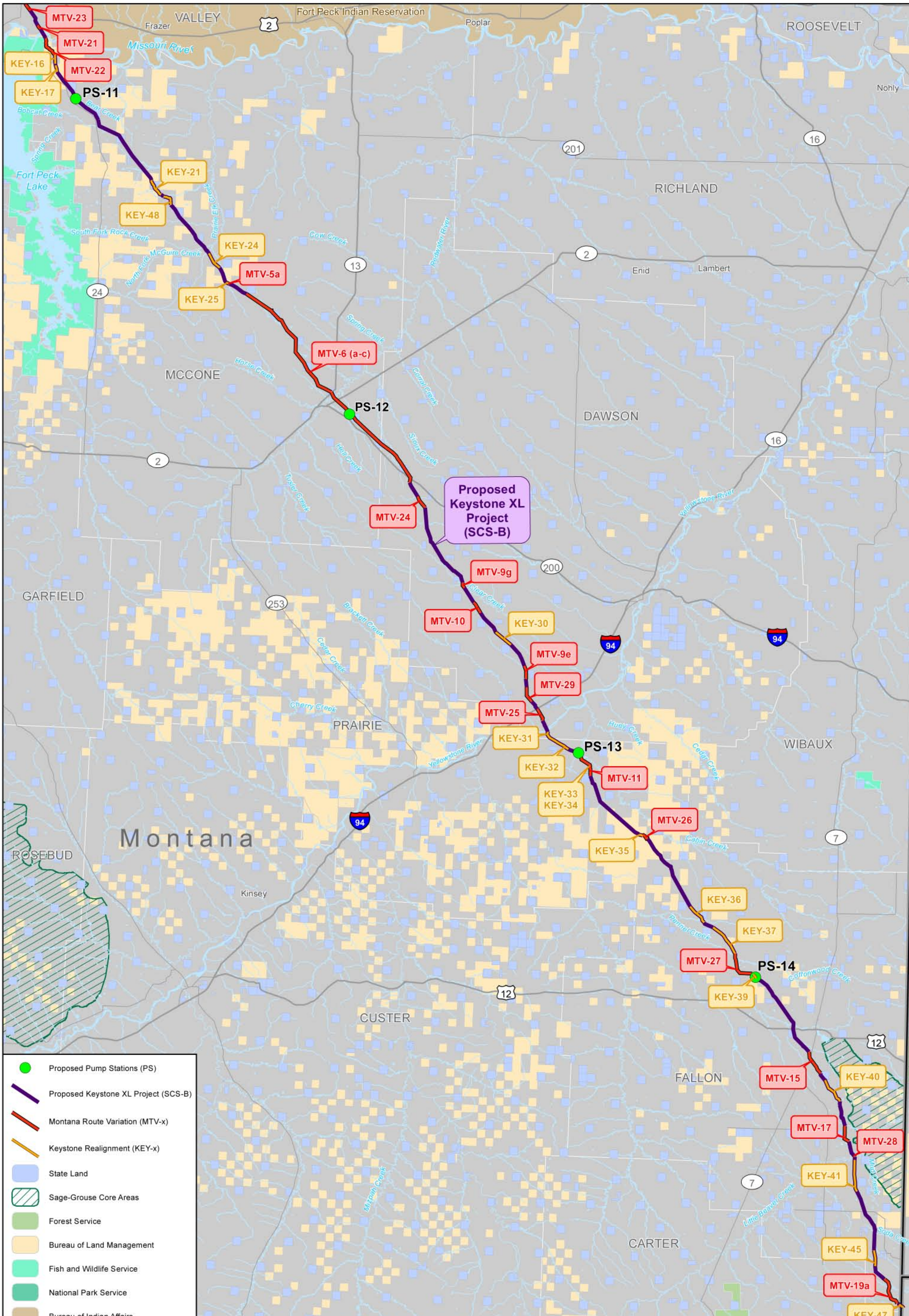


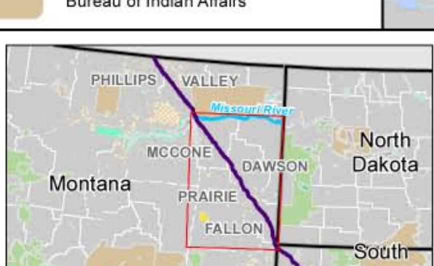

KEYSTONE XL PROJECT

Figure I-2.5-1

SHEET 1 OF 2

Montana Preferred Route




Data Sources: Federal Lands, Basemap - ESRI,
Sage-Grouse - MFWP,
State Land - MT Cadastral/CAMA Project.

0 3.5 7 14 Miles

**KEYSTONE XL PROJECT**

Figure I-2.5-1

SHEET 2 OF 2

Montana Preferred Route

# ATTACHMENT 1

## Montana Department of Environmental Quality

## Environmental Specifications for the Proposed Keystone XL Project in Montana

**STATE OF MONTANA**
**ENVIRONMENTAL SPECIFICATIONS FOR THE**
**KEYSTONE XL PIPELINE PROJECT IN MONTANA**

## TABLE OF CONTENTS

## DEFINITIONS

ACCESS EASEMENT: Any land area over which the OWNER has obtained an easement from a landowner allowing travel to and from the Project. Access easements may or may not include access roads

ACCESS ROAD: Any travel course which is constructed by substantial recontouring of land and which is intended to permit passage by most four-wheeled vehicles

ACCESS ROUTE: Any state highway or county road that will be used to transport equipment, supplies and materials or personnel to and from the Project

ARM: Administrative Rules of Montana

BEGINNING OF CONSTRUCTION: Any project-related earthmoving or removal of vegetation (except for clearing of survey lines)

BLM: United States Department of Interior, Bureau of Land Management

BLM INSPECTOR: BLM employee or designee charged with inspecting the pipeline for compliance with the BLM requirements

BOR: United States Bureau of Reclamation

BOARD: Montana Board of Environmental Review

CERTIFICATE: Certificate of Compliance

CFR: Code of Federal Regulations

DOS: United States Department of State

DEQ: State of Montana, Department of Environmental Quality

DNRC: State of Montana, Department of Natural Resources and Conservation

EIS: Environmental Impact Statement for the Keystone XL Oil Pipeline Project

ENVIRONMENTAL INSPECTOR: Persons hired by the OWNER who shall be responsible for monitoring and ensuring compliance with all mitigation measures required by the CERTIFICATE and these specifications, and other grants, permits, certificates, or other authorizing documents

FWP: State of Montana, Department of Fish, Wildlife, and Parks

INITIAL RECLAMATION:  The clean-up, backfilling, recontouring, respreading of topsoil, repairing of damage to roads and property, seeding, and installation of erosion controls following installation of the facility

LANDOWNER:  The owner of private property or the managing agency for public lands

MCA:  Montana Code Annotated

MDT:  State of Montana, Department of Transportation

MOU:  Memorandum of Understanding

NRCS:  United States Department of Agriculture, Natural Resources Conservation Service

OWNER:  The owner(s) of the facility, and its field representative or other agents

PA:  Programmatic Agreement

ROD:  Record of Decision

ROW:  Right-of-Way

SENSITIVE AREA:  Areas which exhibit environmental characteristics that may make them susceptible to impact from construction of a pipeline facility.  The extent of these areas is defined for each project.  These may include but are not limited to any of the areas listed in Circular MFSA-2 Sections 3.2(1)(d) and 3.4(1)

SHPO:  State of Montana, Montana Historical Society, State Historic Preservation Office

STATE INSPECTOR:  DEQ employee or DEQ's designee with the responsibility for monitoring the OWNER's and OWNER's contractor compliance with terms and conditions of the CERTIFICATE issued for the Project

SPECIAL USE SITES:  Areas disturbed outside the construction right-of-way for a specific purpose including, but not limited to, staging areas, borrow pits, construction work camps, power lines less than 10 miles in length, storage or other building sites, and new sites for construction waste disposal

# INTRODUCTION

These environmental specifications have been developed by DEQ to minimize adverse environmental impacts and would be incorporated into the CERTIFICATE. Measures proposed by the OWNER in its Construction, Mitigation, and Reclamation Plan (CMRP) to minimize adverse environmental impacts are set forth in Appendix B of the Environmental Impact Statement for the Keystone XL Oil Pipeline Project (EIS). If approved by DEQ, the measures proposed by the OWNER also would be incorporated by reference as enforceable provisions of the CERTIFICATE. Should there be a conflict between the environmental specifications developed by DEQ, the measures developed by the OWNER, or measures developed by a federal agency, the more environmentally protective provision would apply.

The purpose of these specifications is to mitigate potential environmental impacts during the construction and reclamation of the pipeline facility in Montana. These specifications are intended to be incorporated into the texts of contracts, plans, and Plan of Operations.

Appendices at the end of these specifications refer to individual topics of concern and to site-specific concerns. Some of the Appendices will be prepared by the OWNER working in consultation with DEQ prior to the start of construction and submitted for review and approval by DEQ. Other Appendices will be prepared by the agencies at the time a decision is made whether to approve the Project.

## *0.0 GENERAL SPECIFICATIONS*

These specifications apply to all lands affected by the pipeline and associated facilities. The OWNER may contract with the LANDOWNER for revegetation or reclamation if the LANDOWNER wants different reclamation standards from those listed herein to apply on the LANDOWNER's property, and if not reclaiming to the standards specified herein, would not adversely impact the public and other LANDOWNERS. Where the LANDOWNER requests practices other than those listed in these specifications, DEQ may authorize such a change provided that the STATE INSPECTOR is notified in writing of the change and determines that the change will not be in violation of (1) the CERTIFICATE; (2) any conditions imposed by DEQ, and (3) DEQ's finding of minimum adverse impact.

On private or state land, these specifications will be enforced by the STATE INSPECTOR. On BLM or other federal lands, enforcement will be the joint responsibility of the STATE INSPECTOR and the BLM INSPECTOR.

## 0.1 ENVIRONMENTAL PROTECTION

The OWNER shall conduct all operations in a manner to protect the quality of the environment.

## 0.2 CONTRACT DOCUMENTS

It is the OWNER's responsibility to ensure compliance with these specifications. If appropriate, the OWNER may incorporate by reference these specifications into contracts executed with its contractors or other agents. The OWNER is responsible for its agent's adherence to these specifications in performing the work.

## 0.3 BRIEFING OF EMPLOYEES

The OWNER shall ensure that its contractor(s) and all field supervisors are provided with a copy of these specifications and informed of the applicability of individual sections to specific procedures. It is the responsibility of the OWNER to ensure its contractor(s), subcontractor(s) and the contractor(s) and subcontractor(s) employees comply with these measures. The OWNER's Project Supervisor shall ensure all employees are informed of and implement the applicable environmental specifications discussed herein prior to and during construction. Site-specific measures provided in the appendices attached hereto shall be incorporated into the design and construction specifications or other appropriate contract document. The OWNER will have regular contact and site supervision of its contractors and subcontractors to ensure compliance is maintained.

## 0.4 COMPLIANCE WITH REGULATIONS

The OWNER shall comply with the CERTIFICATE issued by DEQ and applicable local, state, and federal laws, regulations, and requirements. Pursuant to 75-20-401, MCA, state or local governmental agencies may not require approval, consent, permit, certificate or other conditions for the construction, operation or maintenance of the pipeline following issuance of the CERTIFICATE. DEQ, however, retains authority to determine compliance with air and water quality standards. The OWNER is also required to comply with requirements of County Weed Control Boards (7-22-2201, *et seq*., MCA), state laws regarding use of water (85-1-101, *et seq*., MCA), protection of employees, and easements or licenses authorizing the crossing of state-owned land and the beds of navigable streams or rivers.

The OWNER must:

a) Request any proposed modification to the procedures and measures described in its application submitted pursuant to 75-20-101, *et seq*., MCA or

CERTIFICATE conditions in a written amendment application to DEQ pursuant to 75-20-219, MCA and ARM 17.20.1801 through 1804;

b) Justify each modification relative to site-specific conditions; and

c) Explain how that modification provides an equal or greater level of environmental protection than the original measure.

## *0.5 LIMITS OF LIABILITY*

0.5.1 The OWNER is not responsible for correction of environmental damage or destruction of property caused by negligent acts of DEQ employees during construction, operation and maintenance, decommissioning, and reclamation of the Project.

0.5.2 The OWNER shall annually provide DEQ proof of liability insurance which covers the cost of cleaning up oil spills in Montana.

0.5.3 No person will be held responsible for a pipeline leak that occurs as a result of his/her normal farming practices over the top of or near the pipeline.

0.5.4 The OWNER shall pay commercially reasonable costs and indemnify and hold the LANDOWNER harmless for any loss, damage, claim or action resulting from the OWNER's use of the easement, including any resulting from any release of regulated substances or from abandonment of the facility, except to the extent such loss, damage claim or action results from the gross negligence or willful misconduct of the LANDOWNER or its agents.

## *0.6 DESIGNATION OF SENSITIVE AREAS*

0.6.1 DEQ and the OWNER have designated areas along the ROW and associated facilities as SENSITIVE AREAS. The locations of these SENSITIVE AREAS are described in Appendix A. Additional SENSITIVE AREAS may be added by DEQ after review of plans submitted pursuant to Sections 0.9, 1.1.2, 1.1.4, and 1.1.3. Special precautions and procedures specified in Appendix A and elsewhere in these specifications shall be taken in these areas during construction, operation, and maintenance.

0.6.2 Throughout these specifications DEQ refers to locations of SENSITIVE AREAS and other features by mileposts. These mileposts were developed based on the location of the facility as depicted in the EIS. The OWNER shall depict these SENSITIVE AREAS and features on the final designs required by Sections 1.1.2 and 1.1.3.

### *0.7 PERFORMANCE BOND*

To ensure compliance with these specifications, the OWNER shall submit to DEQ or its authorized agent a bond pertaining specifically to INITIAL RECLAMATION. Post-construction monitoring by DEQ will determine compliance with these specifications and other mitigating measures included herein. At the time INITIAL RECLAMATION is complete and revegetation is progressing satisfactorily, the OWNER shall be released from its obligation for INITIAL RECLAMATION. At the time the OWNER is released, a portion of the bond shall be retained for five years or until monitoring by DEQ indicates that reclamation and revegetation has been successful as described in Section 3 of these specifications. The amount and bonding mechanisms for this section shall be specified by DEQ in Appendix B and agreed to by the OWNER. The bond or bonds shall be submitted to DEQ at least two weeks prior to the start of construction. The OWNER may not start construction until DEQ approves the bond.

### *0.8 ACCESS*

When easements for construction access are obtained, provision will be made by the OWNER to ensure that DEQ personnel and DEQ contractors will be allowed access to the right-of-way and to any off-right-of-way access roads and access easements used for construction during the term of the bonds. Liability for damage caused by providing such access for the STATE INSPECTOR shall be limited by section 0.5 Limits of Liability. The STATE INPSECTOR will inform the OWNER's on-site representative prior to use of any on and off right-of-way access sites. The OWNER shall not prevent STATE INSPECTORS from carrying out their duties under 75-20-402, MCA.

### *0.9 DESIGNATION OF INSPECTORS*

0.9.1 DEQ shall designate a STATE INSPECTOR or INSPECTORS to monitor the OWNER's compliance with these specifications and any other project–specific mitigation measures adopted by DEQ. The STATE INSPECTOR shall be the OWNER's Liaison with the State of Montana on construction, post-construction, and construction reclamation activities for the certified pipeline facility on all lands. The STATE INSPECTOR may coordinate monitoring with BLM. All communications to DEQ shall be submitted to the STATE INSPECTOR. The names of the INSPECTORS are in Appendix C. The STATE INSPECTOR(S) shall implement the Monitoring Plan described in Appendix D.

0.9.2 The OWNER shall employ a team of one or more ENVIRONMENTAL INSPECTORS per construction spread, or as may be established by DEQ. The ENVIRONMENTAL INSPECTORS shall be:

a) Responsible for monitoring and ensuring compliance with all mitigation measures required by the CERTIFICATE and other applicable state grants, permits, certificates, or other authorizing documents;
b) Responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract and any other authorizing document;
c) Empowered to order correction of acts that violate the environmental conditions of the CERTIFICATE and any other authorizing document;
d) A full-time position, separate from all other activity inspectors;
e) Responsible for documenting compliance with the environmental conditions of the CERTIFICATE; and
f) Responsible for maintaining status reports on compliance with all mitigation measures required by the CERTIFICATE and these specifications and other grants, permits, certificates, or authorizing documents.

### *0.10 OTHER MEASURES*

Adoption of other measures may be required for Project approval at the time of certification. These special measures shall be incorporated in Appendix A: SENSITIVE AREAS.

## 1.0 PRECONSTRUCTION PLANNING AND COORDINATION

### *1.1 PLANNING*

1.1.1 Planning of all stages of construction and maintenance activities is essential to ensure that construction-related impacts will be kept to a minimum. Before commencement of construction, the OWNER shall plan the timing of construction, construction and maintenance access and requirements, location of special use sites, and location of associated facilities in order to reduce or minimize impacts to the environment.

1.1.2 At least 45 days before the start of construction, the OWNER shall submit a plan map(s) and an electronic version of the plan map(s) acceptable to DEQ depicting the location of the centerline of the pipeline; all ACCESS ROADS; and associated facilities such as pump stations, valves, power lines less than 10 miles in length, communication facilities, hydrostatic test discharge sites, variations in construction and operational ROW width (Appendix E), vehicle wash or cleaning stations specified by County Weed Control Boards, and if known, and other special use sites. The scale of the map(s) shall be 1:24,000 or larger. In addition the map(s) shall indicate the areas on range and pasture land where the ROW would be stripped of topsoil and areas where soil and vegetation on the working side of the trench would not be removed. These locations must be reviewed and approved by the STATE INSPECTOR prior to construction.

1.1.3 At least 45 days before the start of construction, the OWNER shall file an Implementation Plan, for the review and written approval of DEQ. The OWNER must file revisions to the plan as schedules change. The plan shall identify:

a) How the OWNER will implement the construction procedures and mitigation measures described in its application, and supplemental mitigation measures identified in the EIS for the Project, and those required by the CERTIFICATE;
b) How the OWNER will incorporate or has incorporated these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and ENVIRONMENTAL INSPECTORS;
c) The number of the OWNER's ENVIRONMENTAL INSPECTORS assigned per spread and aboveground facility site, and how the OWNER will ensure that sufficient personnel are available to implement the environmental mitigation;
d) Company personnel, including ENVIRONMENTAL INSPECTORS and contractors, who will receive copies of the appropriate materials in (a) and other communications from DEQ;
e) The location and expected dates of the environmental compliance training the OWNER will give to all personnel involved with construction, restoration, reclamation, and revegetation (including initial and refresher training as the Project progresses and personnel change);
f) The company personnel (if known) and specific portion of the OWNER's organization responsible for compliance;
g) The procedures (including use of contract penalties) the OWNER will follow if noncompliance occurs; and
h) For each component of the facility (pipeline, valves, pump station, road crossings, stream crossings and associated power lines), a Gantt or PERT chart (or similar Project scheduling diagram), and dates for:
   (1) the completion of all required surveys and reports;
   (2) the environmental compliance training of onsite personnel;
   (3) the start of construction; and
   (4) the start and completion of INITIAL RECLAMATION and revegetation.

1.1.4 Construction is anticipated to occur in two consecutive construction seasons. Prior to the start of construction in each of the two years, the OWNER shall submit a Montana Hydrostatic Test Plan (Appendix F) to DEQ for approval. The plan shall identify a final list of all water sources that would be used in Montana for hydrostatic testing, horizontal directional drilling, vehicle washing and dust abatement along with associated withdrawal rates and volumes approved by DNRC, a final list of hydrostatic test water discharge points, volumes and rates of discharges, site specific measures that would be used to prevent rill and gully erosion, and a plan for monitoring the quality of water being discharged.

1.1.5 The OWNER shall submit detailed alignment maps/sheets and an electronic equivalent acceptable to DEQ at a scale not smaller than 1:24,000 identifying staging areas, pipe storage yards, and other areas that would be used or disturbed and have not been identified in plan map(s) required under Section 1.1.2, above. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of LANDOWNER approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally SENSITIVE AREAS are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. DEQ shall make a good faith effort to complete its review as quickly as possible. Each area must be approved in writing by DEQ before construction in or near that area.

1.1.6 If special use sites are not known at the time of submission of the plan map(s), no later than seven days prior to the start of construction at that site, the OWNER shall submit for review and approval supplemental map(s) showing the following information: communication facilities and special use sites, including staging areas, pump stations, safety valves, directional drilling sites and associated staging areas, horizontal boring sites, batch plant sites, borrow pits, work camps, and storage or other buildings. This information shall be presented on a map with a scale of 1:24,000 or larger. The maps shall be accompanied by an electronic version acceptable to DEQ.

1.1.7 Changes or updates to the information submitted in Sections 1.1.2 and 1.1.3 shall be submitted to DEQ for approval as they become available. Changes affecting SENSITIVE AREAS must be submitted to DEQ for review at least five working days before construction at that site and approved before construction at that location by the STATE INSPECTOR. DEQ shall make a good faith effort to complete its review as quickly as possible.

1.1.8 Long-term maintenance routes to all points on the pipeline and associated power lines must be planned before construction begins. Where known, new construction ACCESS ROADS intended to be maintained for permanent use shall be differentiated from temporary ACCESS ROADS on the plan map(s) required under Section 1.1.2, above.

1.1.9 Where requested by a LANDOWNER, at least 30 days prior to any construction in an area on private or state land where a request has been made, the OWNER will provide survey information for the construction right-of-way to document the baseline condition and topography, plant community (con/rec units), vegetative condition of lands enrolled in the Conservation Reserve Program, soil type(s), forage type (high, medium, or low quality grasslands), a map showing the location and species of noxious weeds, riparian areas, fences, and trees (mature or otherwise). The report shall be prepared by a range scientist. The report shall include representative photographs of each such area prior to construction. A copy of the assessment shall be provided to the LANDOWNER at no charge.

### *1.2 PRECONSTRUCTION CONFERENCE*

1.2.1 In each year of construction, before commencement of any construction activities defined in 75-20-104(6)(a) MCA, the OWNER shall hold a preconstruction conference. The STATE INSPECTOR shall be notified of the date and location for this meeting. One of the purposes of this conference shall be to brief the contractor and land management agencies regarding the content of these specifications and other DEQ-approved mitigating measures, and to make all parties aware of the roles of the OWNERS's ENVIRONMENTAL INSPECTOR(S) and STATE INSPECTOR.

1.2.2 The OWNER's representative, the contractor's representative, the OWNER's ENVIRONMENTAL INSPECTOR(S), STATE INSPECTOR, and representatives of affected state and federal agencies who have land management or permit and easement responsibilities shall be invited to attend the preconstruction conference.

### *1.3 PRECONSTRUCTION CONTACT WITH LOCAL OFFICIALS*

1.3.1 In each year of construction, the OWNER shall provide written notification to local and county public officials and game wardens affected by construction near Malta, Glasgow, Circle, Glendive, Terry, and Baker and their respective counties, at least 30 days prior to the beginning of construction. The notice shall provide information on the temporary increase in population, when the increase is expected, and where the workers will be stationed. In each year of construction and prior to the start of construction, the OWNER shall hold a meeting in the closest towns listed above which may be affected for each active construction spread to discuss potential temporary changes. The invited local officials shall include the county commissioners, city administrators, law enforcement officials, local fire departments, emergency service providers, and representatives of the Chambers of Commerce.

### *1.4 HISTORICAL, ARCHAEOLOGICAL AND PALEONTOLOGICAL*

1.4.1 The OWNER shall implement the PA in Appendix G regarding cultural resources.

1.4.2 The OWNER shall implement the measures required by the Paleontological MOU in Appendix H in consultation with the other state and federal agencies listed in Appendix G.

# 2.0 CONSTRUCTION OF FACILITIES

## *2.1 GENERAL*

2.1.1 The preservation of the natural landscape contours and environmental features shall be an important consideration in the location and construction of all associated facilities. Construction of these associated facilities shall be planned and conducted so as to minimize destruction, scarring, or defacing of the natural vegetation and landscape. Any necessary earthmoving shall be planned and designed to be as compatible as possible with natural landforms.

2.1.2 Temporary special use areas shall be the minimum size necessary to accommodate the special use. The temporary special use areas shall be located where most environmentally compatible, considering slope, fragility of soils, or fragility of vegetation, and risk of erosion.

2.1.3 The OWNER shall maintain all work areas in a neat, clean, and sanitary condition at all times. Trash or construction debris (in addition to solid wastes described in Section 2.13) shall be regularly removed during construction, reclamation, and revegetation of the affected areas.

2.1.4 The OWNER shall segregate top soil from subsoil. Excepted as noted in Appendix A, up to 12 inches of topsoil shall be salvaged unless otherwise requested by the LANDOWNER.

2.1.5 In the development of the CMRP in areas where the NRCS recommends or LANDOWNERS request, the OWNER shall conduct analytical soil probing and/or soil boring and analysis in areas of particularly sensitive soils where reclamation potential is low. Records regarding this process shall be available to the STATE INSPECTOR and to the specific LANDOWNER affected by such soils upon request.

2.1.6 Through development of the CMRP and consultation with the NRCS and the LANDOWNER, Keystone shall identify soils for which alternative handling methods are recommended. Alternative soil handling methods shall include but are not limited to the "triple-lift" method where conditions justify such treatment. The ONWER shall thoroughly inform the LANDOWNER regarding the options applicable to their property, including their respective benefits and negatives, and implement whatever reasonable option for soil handling is selected by the LANDOWNER. Records regarding this process shall be available to the STATE INSPECTOR upon request.

2.1.7 The OWNER shall, in consultation with the NCRS and LANDOWNER, ensure that its construction planning and execution process, including CMRP and its other construction documents, shall adequately identify, plan, and implement mitigating measures for areas susceptible to erosion; areas with high concentrations of sodium bentonite; areas with sodic, saline, and sodic-saline soils; and any other areas with low reclamation potential.

2.1.8 The OWNER shall strip topsoil from the trench, the trench plus the stockpile area, or the entire ROW as requested by the LANDOWNER. Soil salvage depths are estimated in Appendix I and actual amounts will be determined during construction as excavation indicates the amount of topsoil available. Other areas outside the pipeline ROW where soil is to be stripped may be designated by the STATE INSPECTOR(S).

2.1.9 Vegetation such as trees, plants, shrubs, and grass on or adjacent to the ROW which do not interfere with the performance of construction work, or operation of the pipeline, shall be preserved.

2.1.10 The OWNER shall take all necessary actions to avoid adverse impacts to SENSITIVE AREAS listed in Appendix A. The STATE INSPECTOR(S) shall be notified two working days in advance of initial clearing or grading in these areas. The OWNER shall mark or flag the clearing limits of disturbance in certain SENSITIVE AREAS as designated in Appendix A and Appendix L. All construction activities must be conducted within this marked area.

2.1.11 The OWNER shall acquire appropriate land rights and provide compensation for damages caused by construction, operation, maintenance, and decommissioning of the pipeline and associated facilities.

2.1.12 Flow in a stream course may not be permanently diverted. If temporary diversion is necessary, flow must be restored before a major runoff season or the next spawning season, as determined by the STATE INSPECTOR(S) in consultation with the managing agencies.

2.1.13 Construction of all pump stations and above ground facilities shall comply with federal and state mandated building and electric safety codes. The OWNER shall adhere to all International Code Council (ICC) regulations relating to the construction of the facility.

## *2.2 CONSTRUCTION MONITORING*

2.2.1 Within one week of starting construction, the OWNER shall submit to DEQ weekly status reports until all construction and INITIAL RECLAMATION activities are complete. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

a) The construction status of each spread, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally SENSITIVE AREAS;
b) A listing of all problems encountered and each instance of noncompliance observed by the ENVIRONMENTAL INSPECTORS during the reporting

period (both for the conditions imposed by DEQ and any environmental conditions/permit requirements imposed by other federal or state agencies);

c) A description of the corrective actions implemented in response to all instances of noncompliance, and their cost;

d) The effectiveness of all corrective actions implemented; and

e) A description of any LANDOWNER complaints that may relate to compliance with the requirements of the CERTIFICATE, and the measures taken to satisfy the concerns.

2.2.2 The STATE INSPECTOR is responsible for implementing the Monitoring Plan contained in Appendix D. The plan specifies the type of monitoring data and activities required and terms and schedules of monitoring data collection, and assigns responsibilities for data collection, inspection reporting, and other monitoring activities.

2.2.3 The STATE or ENVIRONMENTAL INSPECTOR(S) may require mitigating measures or procedures at some sites beyond those listed in the Appendices in order to minimize environmental damage due to unique circumstances that arise during construction. The STATE INSPECTOR and the OWNER will attempt to rely upon a cooperative working relationship to reconcile potential problems relating to minimization of impacts. When construction activities will cause excessive environmental impacts due to seasonal field conditions or damage to sensitive features, the designated STATE INSPECTOR will discuss with the OWNER possible mitigating measures or minor construction rescheduling to avoid these impacts and may impose additional mitigating measures in the area of jurisdiction. The STATE INSPECTOR shall provide the OWNER with written documentation of the reasons for the additional mitigating measures within 24 hours of their imposition. All parties will attempt to adequately identify and address these areas and planned mitigation, to the extent practicable, during final design to minimize conflicts and delays during construction activities.

2.2.4 If these specifications are not being achieved, DEQ may take corrective action as described in 75-20-408, MCA.

## *2.3 TIMING OF CONSTRUCTION*

2.3.1 Construction and motorized travel may be restricted or prohibited at certain times of the year in areas described in Appendix J. Exemptions to these timing restrictions may be granted by the STATE INSPECTOR in writing if the OWNER can clearly demonstrate to affected state agencies that no substantial environmental impacts will occur as a result.

2.3.2 In order to prevent rutting and excessive damage to vegetation outside of wetlands, the OWNER shall not perform construction activities during periods of high soil moisture when construction vehicles will cause rutting deeper than four inches on a) areas where topsoil is not stripped from the construction ROW for the pipeline or other associated facilities or, b) areas where excessive soil mixing is occurring or would occur as a result of the rutting.

2.3.3 In order to reduce rutting and excessive damage to off-right-of-way ACCESS ROADS, vehicle travel shall be restricted during periods when there is a substantial buildup of mud on tires and cleats or formation of ruts deeper than four inches. This condition would be waived if the OWNER shows written approval from the affected LANDOWNER in advance of construction activity on a private road. The OWNER shall present the STATE INSPECTOR with written documentation, a map, and shape file of such LANDOWNER approval at least five days in advance of construction traffic using a road. Nonetheless, the OWNER shall not create hazardous driving conditions on private roads. The OWNER shall repair damage to private roads when conditions dry sufficiently to effect repairs. Damage shall be repaired to a reasonably acceptable condition in consultation with the STATE INSPECTOR and the LANDOWNER.

## *2.4 PUBLIC SAFETY*

2.4.1 All construction activities shall be done in compliance with existing health and safety laws.

2.4.2 After construction is complete, noise levels shall not exceed the following standards as a result of the operation of the facility and associated facilities. For the pipeline and associated facilities, the average annual noise levels, as expressed by an A-weighted day-night scale (Ldn), will not exceed 60 decibels at the fence line or property boundary, whichever is further from the pumps, unless the affected LANDOWNER waives this condition.

## *2.5 PROTECTION OF PROPERTY*

2.5.1 Construction shall not take place over or upon the ROW of any railroad, public road, public trail, or other public property until negotiations and/or necessary approvals have been completed with the LANDOWNER. Where it is necessary to cross a trail with ACCESS ROADS, the trail corridor will be restored. All roads and trails designated by government agencies as needed for fire protection or other purposes shall be kept free of logs, brush, and debris resulting from operations under these specifications. Any such trail damaged by this Project shall be promptly restored to its original condition.

2.5.2 Reasonable precautions shall be taken to protect, in place, all public land monuments and private property corners or boundary markers. If any such land markers or monuments are destroyed, the marker shall be reestablished and referenced in accordance with the procedures outlined in the “Manual of Instruction for the Survey of the Public Land of the United States" or, in the case of private property, the specifications of the county engineer. Reestablishment will be at the expense of the OWNER.

2.5.3 Construction shall be conducted so as to prevent damage to existing property including, but not limited to, water lines, transmission lines, distribution lines, telephone lines, pipelines, railroads, ditches, irrigation canals, and fiber optic lines. If such property is damaged by construction, operation, or decommissioning, the OWNER shall repair such damage immediately to a reasonably satisfactory condition in consultation with the LANDOWNER.

2.5.4 In areas with livestock, the OWNER shall comply with the reasonable requests of LANDOWNERS regarding measures to control livestock or wildlife until the vegetation meets the standards established in Section 3.2.1(b) and Appendix A. LANDOWNERS shall be compensated for lost grazing during reclamation. Where requested by LANDOWNERS, temporary gates shall be constructed of sufficiently high quality to withstand repeated opening and closing during construction, to the satisfaction of the LANDOWNER. Care shall be taken to ensure that all gates are left in the condition in which they are found upon entry. The LANDOWNER shall be compensated for any losses to personal property due to construction, operation, maintenance, or decommissioning activities. Gates shall be inspected and repaired when necessary during construction and decommissioning. Any gates installed by the OWNER shall be inspected and repaired when necessary during the operation and maintenance period. When wire fences are replaced, wire shall be stretched tight with a fence stretcher before stapling or securing to the fence posts.

2.5.5 During construction, operation, and decommissioning, the OWNER must notify the STATE INSPECTOR and, if possible, the affected LANDOWNER within two working days of damage to land, crops, property, or irrigation facilities; contamination or degradation of water; or livestock injury caused by the OWNER's activities. The OWNER shall restore any damaged resource or property, or provide reasonable compensation to the affected party.

2.5.6 The OWNER shall install permanent gates as requested by a LANDOWNER to provide access for maintenance vehicles.

2.5.7 When facilities cross fences, the OWNER shall make reasonable effort to accommodate the LANDOWNER's wishes on gate location and width.

2.5.8 Any breaching of natural barriers to livestock movement by construction activities will require fencing sufficient to control livestock unless alternative arrangements are made with the affected LANDOWNER. Alternative arrangements shall be indicated on a line list or environmental worksheet describing these arrangements and submitted to the STATE INSPECTOR prior to construction.

2.5.9 During construction and operation, the OWNER shall preserve wind breaks where they would not interfere with operation of the pipeline, unless otherwise requested by a LANDOWNER.

### *2.6 TRAFFIC CONTROL*

2.6.1 Before beginning any construction within a state highway ROW, the OWNER shall consult with the appropriate MDT field office regarding the proposed occupancy and to resolve any problems. The OWNER shall provide DEQ with documentation that this consultation has occurred at least 30 days before the start of construction in each year of construction. This documentation shall identify measures recommended by MDT and to what extent the OWNER agrees to comply with these measures. In the event the OWNER does not agree to a measure recommended by MDT, DEQ shall resolve any disputes regarding state highways.

2.6.2 In areas where the construction creates a potential hazard on ACCESS ROUTES, the OWNER shall control traffic according to the applicable MDT regulations. Safety signs or flaggers advising motorists of construction equipment shall be placed on major state highways, as required by MDT and on county roads, as required by the applicable county, and in accordance with the Manual on Uniform Traffic Control Devices. The installation of proper road signing will be the responsibility of the OWNER.

2.6.3 The managing agency shall be notified, as soon as practicable, when it is necessary to close public roads to public travel for short periods to provide safety during construction. If roads are closed to public travel for more than 30 minutes, a detour shall be provided.

2.6.4 Construction vehicles and equipment will be operated at speeds safe for existing road and traffic conditions.

2.6.5 Access for fire and emergency vehicles will be provided at all times.

2.6.6 Public travel through and use of active construction areas shall be limited at the discretion of the managing agency.

### *2.7 ACCESS ROADS AND VEHICLE MOVEMENT*

2.7.1 Construction of new ACCESS ROADS shall be held to the minimum reasonably required to construct and maintain the facility. State, county, and other existing roads shall be used for construction access wherever possible. ACCESS ROADS intended to be permanent should be appropriately designed. The location of ACCESS ROADS shall be established in consultation with affected LANDOWNERS, and LANDOWNER concerns shall be accommodated where reasonably possible and not in contradiction to these specifications or other DEQ conditions.

2.7.2 All new roads to and from the pipeline construction ROW, both temporary and permanent, shall be constructed with the minimum possible clearing and soil disturbance to minimize erosion.

2.7.3 Where practical, all roads shall be designed to accommodate one-way travel of the largest piece of equipment plus pull-outs for passing. Road width shall be no wider than necessary.

2.7.4 Where practical, temporary ACCESS ROADS shall be constructed on the most level land available. Where temporary roads cross flat land, they shall not be graded or bladed unless necessary, but will be flagged or otherwise marked to show their location and to prevent travel off the roadway.

2.7.5 The OWNER will maintain all permanent ACCESS ROADS, including drainage facilities, which are constructed for use during the period of construction. In the event that a road would be left in place, the OWNER and LANDOWNER may enter agreements regarding maintenance for erosion control following construction.

2.7.6 All permanent ACCESS ROAD surfaces, including those under construction, will be prepared with the necessary erosion control practices as determined by the STATE INSPECTOR or the managing agency prior to the onset of winter.

2.7.7 Snow removal shall be done in a manner to preserve and protect topsoil, road signs, and culverts; to ensure safe and efficient transportation; and to prevent excessive erosion to roads, streams, and adjacent land.

2.7.8 At the conclusion of construction, final maintenance will be performed on all existing private roads used for construction access by the OWNER. These roads will be returned to a condition at least as good as when construction began.

## *2.8 EQUIPMENT OPERATION*

2.8.1 During construction, unauthorized cross-country travel and the development of roads other than those approved shall be prohibited. The OWNER shall be liable for any damage, destruction, or disruption of private property and land caused by construction personnel and equipment as a result of unauthorized cross-country travel and/or road development.

2.8.2 To prevent excessive soil damage in areas where a graded roadway has not been constructed, the limits and locations of access for construction equipment and vehicles shall be marked or specified at each new site before any non-survey related equipment is moved to the site. Construction foremen and personnel shall be well versed in recognizing these markers and shall understand the restriction on equipment movement that is involved.

2.8.3 Work crew foremen shall be qualified and experienced in the type of work being accomplished by the crew they are supervising. Earthmoving equipment shall be operated only by qualified, experienced personnel.

2.8.4 Prior to the start of construction, final locations of cleaning stations and other conditions required by County Weed Control programs will be shown on environmental worksheets or an appended line list and indicated on appropriate project maps (see Section 2.1.1). Vehicles shall be cleaned and weed infested areas will be pre-treated. The OWNER shall submit copies of the revegetation plans approved by the County Weed Control Boards pursuant to 7-22-2152, MCA, and comply with these plans. The approved plans shall be included in Appendix K.

2.8.5 Gravel/stone ramps will be installed at access points to paved public roads, as needed, to prevent or minimize the tracking of mud, dirt, sediment, or similar materials onto the roadway. Deposits that have been tracked by vehicles or that have been transported by wind or storm run-off from the ROW will be promptly cleaned up.

## *2.9 RIGHT-OF-WAY CLEARING AND SITE PREPARATION*

2.9.1 The STATE INSPECTOR shall be notified at least 10 days prior to any timber clearing.

2.9.2 For associated power lines, where no grading occurs during clearing of the construction ROW, shrubs shall be preserved to the greatest extent possible. Shrub removal shall be limited to crushing or cutting where necessary. Plants may be cut off at ground level, leaving roots undisturbed so that they may re-sprout.

2.9.3 Clearing on both the working side and the spoil side of the ROW shall be kept to the minimum necessary. Where clearing of trees is necessary, the ROW boundary shall be flagged to identify trees located outside the right-of-way.

2.9.4 During construction, care will be taken to avoid damage to trees and shrubs on the edge of the construction ROW that do not interfere with clearing requirements. Trees along the margin of the ROW that are of high value, as determined by the LANDOWNER or INSPECTORS, shall be wrapped with snow fence to protect them from damage.

2.9.5 Unless otherwise requested by the LANDOWNER, felling shall be directional in order to minimize damage to remaining trees. Maximum stump height shall be no more than 12 inches on the uphill side, or 1/3 the tree diameter, whichever is greater.

2.9.6 The OWNER shall prevent significant amounts of soil from being contained in the piling and windrowing of material to be burned. The OWNER shall also minimize the destruction of ground cover in the piling and windrowing of material to be burned. The OWNER shall use non-mechanized methods if necessary to minimize soil erosion and vegetation disturbance. Piles shall be located so as to minimize danger to timber and damage to ground cover when burned.

## *2.10 EROSION AND SEDIMENT CONTROL*

2.10.1 The OWNER shall comply with the erosion control measures described in the Storm Water Pollution Prevention Plan filed with DEQ.

2.10.2 The open-cut, wet method of constructing stream crossings is not allowed if water is present at the time of construction.

2.10.3 At least 60 days prior to the start of construction at a perennial stream crossing or at the crossing of a stream containing a fish species of special concern, the OWNER shall submit a site-specific Stream Crossing Plan. At least 30 days prior to constructing the facility or associated facilities at a perennial stream crossing or stream containing a fish species of special concern, the STATE INSPECTOR shall conduct an on-site inspection of the crossing. The OWNER shall provide access to the stream crossing. The STATE INSPECTOR shall invite the OWNER, FWP, representatives of the local conservation district(s), and the LANDOWNER or land management agency to attend this inspection. The purpose of the inspection shall be to determine the final location of the crossing, the crossing method, width and depth of burial to be used and site-specific reclamation measures. The results of these inspections shall be included in Appendix L.

2.10.4 The OWNER shall install culverts or other structures in state waters in accordance with DEQ 318 permit conditions.

2.10.5 ACCESS ROADS shall cross drainage bottoms at sharp or nearly right angles, and avoid tall cut banks requiring cut and fills whenever possible. Use of temporary bridges, fords, culverts, or other structures to avoid stream bank damage is required when water is present at the crossing of streams. A one-time crossing of the stream to install temporary crossings may be allowed if no access is readily available. No stream crossings will be allowed without proper water quality permits and written authorization from DEQ.

2.10.6 Streambed materials shall not be removed for use in backfill, embankments, road surfacing, or for other construction purposes except where removed from the trench at a stream crossing.

2.10.7 Trench breakers will be installed where necessary to control the flow of ground water along the trench.

2.10.8 Blasting may be allowed in or near streams if precautions are taken to protect the stream from debris and entry of nitrates or other contaminants into the stream, after applicable permits and authorizations are obtained. The OWNER shall obtain the written approval of the STATE INSPECTOR prior to conducting any blasting near streams.

2.10.9 The OWNER shall be responsible for the stability of all embankments created during construction. Embankments and backfills shall contain no stream sediments, frozen material, large roots, sod, or other materials which may reduce their stability.

2.10.10 Culverts, arch bridges, or other stream crossing structures shall be installed at all permanent crossings of flowing or dry watercourses where fill is likely to wash out during the life of an ACCESS ROAD. On ACCESS ROADS, all temporary culverts shall be sized to pass 2-year flood requirements and shall be removed after reclamation. The STATE INSPECTOR may approve exceptions. Permanent culverts shall be sized to pass the 100-year flood requirements. Culvert size shall be determined by standard procedures which take into account the variations in vegetation and climatic zones in Montana, the amount of fill, and the drainage area above the crossing. All culverts shall be installed at the time of ACCESS ROAD construction.

2.10.11 No perennial watercourses shall be permanently blocked or diverted.

2.10.12 The OWNER shall maintain instream flow during diversion of hydrostatic test water so that instream flows do not fall below the following rates in streams where FWP holds water reservations to protect instream flows. Instream flow rates and volumes are indicated in Table 1.

**TABLE 1**
**Montana Fish, Wildlife and Parks Instream Reservations**

| **Stream** | **Reach** | **Dates** | **Flow** | | |
|---|---|---|---|---|---|
| | | | **Cubic feet/second** | **Acre feet** | **Acre feet/year** |
| **Frenchman River** | International boundary to mouth | Jan., Feb., Mar., Dec. | 2.0 | 480 | 2,900 |
| | | Apr. through Nov. | 5.0 | 2,420 | |
| **Rock Creek** | International boundary to mouth | Jan., Feb., Mar., Dec. | 2.0 | 480 | 4,352 |
| | | Apr. through Nov. | 8.0 | 3,872 | |
| **Missouri River #8** | Milk River to state line | Year-round | 5,178 | | 3,748,500 |

| TABLE 1<br>Montana Fish, Wildlife and Parks Instream Reservations | | | | | |
|---|---|---|---|---|---|
| | | | Flow | | |
| **Stream** | **Reach** | **Dates** | **Cubic feet/second** | **Acre feet** | **Acre feet/year** |
| **Redwater River #1** | Circle to East Redwater Creek | Jan., Feb., Mar., Dec. | 2.0 | 480 | 1,932 |
| | | Apr. through Nov. | 3.0 | 1,452 | |
| **Redwater River #2** | East Redwater Creek to mouth | Jan., Feb., Mar., Dec. | 2.0 | 480 | 2,416 |
| | | Apr. through Nov. | 4.0 | 1,936 | |
| **Box Elder Creek** | One mile west of Belltower to state line | Jan., Feb., Mar., Dec. | 4.0 | 960 | 4,348 |
| | | Apr. through Nov. | 7.0 | 3,388 | |
| **Little Beaver Creek** | Russell Creek to state line | Year-round | 3.0 | 2,171 | 2,171 |

2.10.13 The OWNER shall implement the DEQ-approved Montana Hydrostatic Test Plan (Appendix E).

2.10.14 Any accidental spills of oils, contaminants, or any other hazardous materials shall be cleaned up immediately per Appendix M. The STATE INSPECTOR shall be notified of spills of hazardous materials.

2.10.15 Point discharge of hydrostatic test water will be dispersed in a manner that prevents discharge to state waters unless appropriate permits are obtained.

2.10.16 Water used in embankment material processing, aggregate processing, concrete curing, foundation and concrete lift cleanup, and other waste water processes shall not be discharged into surface waters without a valid discharge permit from DEQ.

2.10.17 If trench dewatering is necessary, water will be discharged to the ground where adequate vegetative cover exists to prevent channeling and sediment transport, or into temporary dewatering structures constructed of silt fence and/or straw bales. No discharges to surface waters are allowed without a valid construction Dewatering General Permit authorization letter from DEQ.

2.10.18 No biocides or other chemicals shall be added to hydrostatic test water. The OWNER shall collect a sample from each hydrostatic test water source, and water samples from the pipe will be taken during discharge of the hydrostatic test water and tested. The testing will be for iron, heavy metals, total organic compounds, and any additives. A report containing the results of this testing shall be submitted to the STATE INSPECTOR.

2.10.19 Except for water bars and other erosion controls, the final reclaimed surface shall not interrupt drainages or substantially alter overland flow patterns.

### *2.11 ARCHAEOLOGICAL, HISTORICAL, AND PALEONTOLOGICAL RESOURCES*

2.11.1 All construction activities shall be conducted in accordance with the PA in Appendix G for Historic Properties and inadvertent discoveries. For Historic Properties where impacts cannot be avoided, a mitigation plan shall be developed per the PA in consultation with all interested parties.

2.11.2 Prior to and during construction activities, the OWNER shall handle paleontological resources in accordance with the MOU and Paleontological Treatment Plan set forth in Appendix H.

2.11.3 In the event of inadvertent discovery of paleontological materials during construction activities, the OWNER shall follow the Paleontological Treatment Plan as required in the MOU in Appendix H.

### *2.12 PREVENTION AND CONTROL OF FIRES*

2.12.1 The OWNER shall comply with the Fire Prevention and Suppression Plan set forth in Appendix N. These plans shall meet the requirements of the managing agency and/or the fire control agencies having jurisdiction. The STATE INSPECTOR shall be invited to attend all meetings with these agencies to discuss or prepare these plans.

2.12.2 The OWNER shall not burn refuse (including but not limited to trash, rags, tires, plastics, or other debris) except as permitted by the county, town, state, or governing municipality having jurisdiction per the Burning Plan and Fire Plan in Appendix O.

2.12.3 Prior to burning any refuse, the OWNER shall obtain the approval of the LANDOWNER and a Montana Open Burning Permit.

### *2.13 WASTE DISPOSAL*

2.13.1 The OWNER shall use licensed solid waste disposal sites. Inert materials (Group III wastes) may be disposed of at Class III landfill sites; mixed refuse (Group

II wastes) shall be disposed of at Class II landfill sites as required by ARM 17.50.504(2)(a).

2.13.2 Emptied pesticide containers or other chemical containers must be triple rinsed to render them acceptable for disposal in Class II landfills or for scrap recycling pursuant to ARM 4.10.803. Names of Class II landfills in the counties crossed are listed in Table 2. Pesticide residue and pesticide containers shall be disposed of in accordance with ARM 4.10.805 and 806. Pesticide container rinse water shall be added to batches of pesticide for application.

**Table 2**
**Class II Landfills in the Counties Crossed by the Project**

| County | Class II Landfill | Location | Phone |
|---|---|---|---|
| **Fallon** | Coral Creek Landfill | Baker, MT | (406) 778-7111 |
| **Valley** | Valley County Refuse District #1 | Glasgow, MT | (406) 228-6241 |
| **Custer** | Miles City Area Solid Waste District | Miles City, MT | (406) 233-3325 |
| **Richland** | Richland County Solid Class II Landfill | Sidney, MT | (406) 433-2407 |

2.13.3 All waste material that is a hazardous waste, as defined in Section 75-10-403, MCA, and wastes containing any concentration of polychlorinated biphenyls must be transported to an approved designated hazardous waste management facility, as defined in ARM 17.50.504, for treatment or disposal.

2.13.4 All used oil shall be hauled away and recycled or disposed of in a licensed Class II landfill authorized to accept liquid wastes or in accordance with Sections 2.13.2 and 2.13.3. There shall be no intentional release of oil or other toxic substances into streams or soil. The OWNER shall immediately report any accidental spill into a waterway to the STATE INSPECTOR. Any spill of refined petroleum products greater than 25 gallons must be reported to the State of Montana, Department of Military Affairs, Disaster and Emergency Services Division, at (406) 841-3911. All spills shall be cleaned up in accordance with the OWNER's Emergency Spill Response Plan.

2.13.5 All hazardous wastes and materials shall be stored in appropriate secondary containment structures until disposed of.

2.13.6 Self-contained toilets shall comply with applicable federal, state, and local health laws and regulations.

2.13.7 The OWNER shall not dispose of waste in any manner that causes it to reach state waters.

# 3.0 CLEANUP, RECLAMATION, AND RESTORATION

## *3.1 BACKFILLING, GRADING, AND CLEANUP*

3.1.1 Except where practicably infeasible, the trench shall be backfilled within 30 days of initial excavation at any location, and no more than 30 miles of open trench will be allowed at any time within any given construction spread. Exceptions include tie-ins, valve sites, and at pump stations where the trench shall be backfilled as soon as practicable.

3.1.2 Except where practicably infeasible, final grading, topsoil replacement, and installation of permanent erosion control structures shall be completed in non-residential areas within 20 days after backfilling the trench. In the event that seasonal or other weather conditions, extenuating circumstances, or unforeseen developments beyond the OWNER's control prevent compliance with this time frame, temporary erosion controls shall be maintained until conditions allow completion of cleanup and reclamation. In the event the OWNER cannot comply with the 20-day time frame as provided in this specification, the OWNER shall give notice of such fact to all affected LANDOWNERS, and such notice shall include an estimate of when such restoration is expected to be completed.

3.1.3 The OWNER shall remove all litter from the ROW, pipe yards, along ACCESS ROADS leading to the ROW, and all other areas affected by construction. Such litter shall be legally disposed of as soon as possible, but in no case later than within 60 days of completion of construction.

3.1.4 All signs of temporary construction facilities such as haul roads, work areas, buildings, foundations or temporary structures, stockpiles of excess or waste materials, and any other vestiges of construction shall be removed and the areas reclaimed, in consultation with the LANDOWNER.

3.1.5 If voids over the pipeline occur, they shall be reported to the STATE INSPECTOR along with a plan for repair of these areas. Repairs must be made as quickly as reasonably possible without causing undue damage, as agreed to by the STATE INSPECTOR. All material used in repairs must be from sources certified to be weed free.

## *3.2 RESTORATION, RECLAMATION, AND REVEGETATION*

3.2.1 Restoration, reclamation, and revegetation of the ROW; ACCESS ROADS; borrow sites, gravel, fill, stone, or aggregate excavation; or any other disturbance shall be in accordance with the OWNER's Construction, Mitigation, and Reclamation Plan with the following exceptions:

a) Seeding of affected lands shall be conducted during the first normal period for favorable planting conditions after final preparation. Final preparation will not be delayed more than 45 days after pipe is lowered into the trench. Any rills or gullies that would preclude successful establishment of vegetation shall be removed or stabilized. Only certified weed-free seed and mulch shall be used in revegetation; and

b) The following standards for reclamation shall be used to determine compliance with the terms of the CERTIFICATE and release of the Reclamation Bond, or to determine that expenditure of the Reclamation Bond is necessary to meet the requirements of the CERTIFICATE for the Project:

(i) in rangeland or pasture land, coverage of desirable perennial plant species shall be 30% or more of that on adjacent rangeland or pastureland of similar slope and topography the year following seeding, and 80% or more of the coverage of adjacent rangeland or pastureland of similar slope and topography within five years following seeding;

(ii) The OWNER shall be responsible for restoring vegetative cover on all CRP areas, to a cover similar to adjacent undisturbed CRP lands with similar soils and topography within five years, unless the land is removed from CRP;

(iii) on private lands, the OWNER may contract with the LANDOWNER for revegetation or reclamation, which would release the OWNER from the reclamation bond performance on the property upon showing DEQ that the LANDOWNER wants different reclamation standards from those specified in (i) applied on his property and that not reclaiming to the standards specified in (i) would not have adverse impacts on the public and other LANDOWNERS; and

(iv) on public lands, the OWNER may contract with the affected land management agency for revegetation or reclamation, which would release the OWNER from the reclamation bond performance on the property upon showing DEQ that the land management agency wants different reclamation standards from those specified in (i) and that not reclaiming to the standards specified in (i) would not have adverse impacts on the public and other LANDOWNERS.

3.2.2 After construction is complete, and in cooperation with the LANDOWNER, temporary roads shall be closed, and unless specified by the LANDOWNER, revegetated as specified in (a) or (b) above. Permanent unsurfaced ACCESS ROADS not open to public use shall be revegetated as soon after use as possible, unless specified otherwise by the LANDOWNER.

3.2.3 Earth next to the pipeline or ACCESS ROADS that cross streams shall be replaced at slopes less than the normal angle of repose for the soil type involved.

3.2.4 Side-casting of waste materials from the construction of permanent ACCESS ROADS may be allowed on slopes over 40 percent after approval by the LANDOWNER. Side-casting of waste material, however, shall not be allowed within the buffer strip established for stream courses, in areas of high or extreme soil instability, or in other SENSITIVE AREAS specifically identified in Appendix A.

3.2.5 Seeding prescriptions, the seeding rate to be used in revegetation, and requirements for hydro seeding, fertilizing, and mulching (collectively referred to as the seeding methodology) shall be based on the requirements of County Weed Control Boards, and the availability of seed at the time of reclamation. The OWNER shall submit its proposed seeding methodology to DEQ at least 30 days prior to the start of construction. The county approved seeding methodology will be incorporated into the Revegetation Rehabilitation Plan set forth in Appendix I.

3.2.6 Excavated material not suitable or required for backfill shall be evenly distributed over the cleared area prior to spreading any topsoil, unless otherwise required by the LANDOWNER. The size and quantity of large (greater than 3 inches) rocks and boulders on the surface of the ROW following final clean-up shall be similar to that present on adjacent undisturbed land. All rock removed from the ROW shall be disposed of as directed by the LANDOWNER.

3.2.7 The OWNER shall use specific seed mixes and techniques that address areas having saline, sodic, or saline and sodic soil characteristics; steep slopes; sandy or clayey textures; or acid soil conditions.

3.2.8 The OWNER shall alleviate soil compaction as proposed or where requested by the LANDOWNER; compaction may be alleviated on all lands traversed by construction equipment by plowing using appropriate deep-tillage and draft equipment. Alleviation of compaction of the topsoil shall be performed during suitable weather conditions, and must not be performed when weather conditions have caused the soil to become so wet that activity to alleviate compaction would damage the future production capacity of the land.

3.2.9 If there is any dispute between the LANDOWNER and OWNER as to what areas need to be ripped or chiseled, or the depth at which compacted areas should be ripped or chiseled, a professional soil scientist shall be consulted. The OWNER shall retain a professional soil scientist or an appropriately qualified, licensed, professional engineer to conduct compaction tests. Copies of the results shall be provided to the LANDOWNER making claims for compensation for damages. If complete restoration is not possible, the OWNER shall compensate the LANDOWNER for lost productivity.

3.2.10 In the case of a claim for damages related to soil compaction, the OWNER shall retain a professional soil scientist who is also licensed by the State of Montana or an appropriately qualified licensed professional engineer to perform a soil survey for compaction using appropriate field equipment such as a soil penetrometer. Where there are row crops, samples shall be taken in the middle of the row, but not in rows where the drive wheels of farm equipment normally travel. Copies of the results of the above-described survey shall be provided to the LANDOWNER making such claim within 45 days of completion of the soil survey.

3.2.11 The OWNER shall develop and implement an environmental complaint resolution procedure. The procedure shall provide LANDOWNERS with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction and operation of the Project. Prior to construction, the OWNER shall mail the environmental complaint resolution procedure to each LANDOWNER whose property would be crossed by the Project:

a) In the complaint resolution procedure, the OWNER shall:
   (i) Provide a local contact that LANDOWNERS shall call first with their concerns and indicate how soon to expect a response;
   (ii) Instruct LANDOWNERS that if they are not satisfied with the response, they should call the OWNER, provide a phone number for the OWNER, and indicate how soon to expect a response; and
b) In addition, during construction and reclamation the OWNER shall include in its weekly status report a table that contains the following information for each problem/concern:
   (i) The identity of the caller and the date of the call;
   (ii) The identification number from the certificated alignment sheet(s) of the affected property and appropriate location by milepost;
   (iii) A description of the problem/concern; and
   (iv) An explanation of how and when the problem was resolved or will be resolved, or why it has not been resolved.

## *3.3 MONITORING*

3.3.1 Upon notice by the OWNER, the STATE INSPECTOR will schedule initial post-construction field inspections following clean up and road closure. The STATE INSPECTOR will notify the OWNER of these inspections. Follow-up visits will be scheduled as required to monitor the effectiveness of erosion controls and reseeding measures. The OWNER will contact the LANDOWNER for post-construction access and to document the LANDOWNER’s satisfaction with the OWNER’s restoration measures; such documentation shall be provided to the STATE INSPECTOR. The STATE INSPECTOR shall document observations for inclusion in monitoring reports regarding bond release or the success of mitigation measures.

3.3.2 Success of revegetation shall be based on criteria specified in Section 3.2.1 (i), (ii), (iii), or (iv).

3.3.3  Failure of the OWNER to adequately reclaim all disturbed areas in accordance with Section 3.2 of these specifications shall be cause for forfeiture of the bonds and/or penalties described in Section 0.7.

# 4.0  OPERATION AND MAINTENANCE

## *4.1  RIGHT-OF-WAY MANAGEMENT AND ROAD MAINTENANCE*

4.1.1  Depressions, holes, cracks, uneven settling, or water drainage problems that develop over or near the trench that interfere with natural drainage or vegetation establishment, shall be repaired by the OWNER within 45 days (weather permitting) of being reported or observed.  Depressions, holes, cracks, uneven settling, or water drainage problems that develop over or near the trench that interfere with land use shall be repaired as expediently as practicable but in no case more than 45 days later (weather permitting) of being reported or observed by the OWNER or, at the LANDOWNER's request.

4.1.2  Vegetation that has been saved through the construction process and which does not pose a hazard or potential hazard to the pipeline, particularly that of value to fish and wildlife, shall be allowed to grow on the ROW.

4.1.3  Vegetative cover, water bars, cross drains, and the proper slope shall be maintained on permanent ACCESS ROADS and service roads in order to prevent soil erosion.

4.1.4  All permanent above-ground facilities shall be painted or treated to blend with their natural surroundings.  The color shall be selected from colors similar to the standard environmental colors (BLM Rocky Mountain Five-State Interagency Committee) in consultation with the BLM and DEQ.

## *4.2  MAINTENANCE INSPECTIONS*

4.2.1  The OWNER shall correct soil erosion or revegetation problems on the ROW or ACCESS ROADS.  The OWNER is responsible for permanent erosion controls on the facility for the life of the Project.  The OWNER may correct such problems through agreement with the LANDOWNER.

4.2.2  Operation and maintenance inspections using ground vehicles shall be timed so that routine maintenance shall be done when ACCESS ROADS are firm, dry, or frozen, wherever possible.  On rangeland, maintenance vegetative clearing shall be conducted in a manner that encourages growth of shrubs up to three feet tall, including sage brush, on the ROW unless otherwise requested by a LANDOWNER.

Shrubs may be removed along a 10-foot wide path within the ROW to allow for maintenance access.

### *4.3 CORRECTION OF LANDOWNER PROBLEMS*

4.3.1 If the facility causes interference with radio, TV, or other stationary communication systems after the facility is operating, the OWNER shall correct the interference.

### *4.4 HERBICIDES AND WEED CONTROL*

4.4.1 Weed control, including any application of herbicides in the right-of-way, will be in accordance with recommendations of the Montana Department of Agriculture and local Weed Control Boards.

4.4.2 Herbicides will not be used in certain areas identified by DEQ and FWP, as listed in Appendix P or as requested by the LANDOWNER.

4.4.3 Proper herbicide application methods will be used to keep drift and non-target damage to a minimum.

4.4.4 Herbicides must be applied according to label specifications and in accordance with Section 4.4.1, above. Only herbicides registered in compliance with applicable federal and state regulations may be applied.

4.4.5 In areas disturbed by the pipeline and associated facilities, the OWNER will cooperate with LANDOWNERS in the control of noxious weeds and provide 48 hours notification before weed treatment is completed on private land.

4.4.6 All applications of herbicides must be performed by an applicator with a valid Montana license.

4.4.7 During the second and third growing seasons following the completion of restoration and reseeding, the OWNER and STATE INSPECTOR shall inspect the ROW and ACCESS ROADS for newly established stands of noxious weeds. The OWNER shall provide access for the inspection. The County Weed Control supervisor shall be invited to attend this inspection. In the event that stands of weeds are encountered, appropriate control measures shall be taken by the OWNER.

### *4.5 MONITORING*

4.5.1 DEQ may continue to monitor operation and maintenance activities for the life of the Project in order to ensure compliance with the specifications in this section.

4.5.2  DEQ may require the OWNER to fund additional monitoring efforts to resolve problems which develop after release of the bonds described in Section 0.7.  Such efforts would be limited to compliance with these specifications and other conditions adopted by DEQ.

# 5.0  MITIGATION OF POSSIBLE ENVIRONMENTAL IMPACTS DUE TO DECOMMISSIONING OR ABANDONMENT

## *5.1  NOTICE AND RECLAMATION*

5.1.1  One year prior to the anticipated date for decommissioning or abandonment of the certificated facility, the OWNER shall notify DEQ or its successor of the plans for decommissioning or abandonment.

5.1.2  If the method of decommissioning or abandonment required under federal law results in ground disturbing activities, OWNER shall be responsible to DEQ or its successor for complying with reclamation and environmental protection standards established at the time of Project certification, including applicable provisions of these specifications or standards in affect at that time.  At that time, DEQ or its successor shall calculate and a hold a bond for reclamation of disturbances caused by decommissioning or abandonment activities.  The OWNER shall submit the bond to DEQ prior to the start of decommissioning or abandonment activities.

5.1.3  The OWNER will be responsible for repairs and reclamation caused by erosion or subsidence of the right-of-way associated with the presence of the facility incurred after abandonment.

5.1.4  The standards listed in Section 3.2.1for reclamation and revegetation shall be used to determine release of the Reclamation and Revegetation Bond, or to determine that expenditure of the Reclamation and Revegetation Bond is necessary to meet the requirements of the CERTIFICATE, unless otherwise determined by the DEQ.

# Appendices

## Appendix A:  Sensitive Areas

The following provisions shall be followed to assist in the protection of biological resources during construction and operations:

- All vehicles, equipment, bridges, and matting that would be used in streams or wetlands must be washed and dried before entering the job site in order to reduce the chances of transporting aquatic nuisance species to Montana streams and wetlands.  Likewise, hydrostatic test water from other states must not be discharged into Montana waters in order to reduce the chances for transporting aquatic nuisance species to Montana streams and wetlands.
- Prior to the start of construction, the OWNER shall conduct surveys to determine the locations of greater sage-grouse leks and the peak number of males in attendance at these leks within three miles of the facility, unless the facility is screened by topography.  The OWNER shall use survey methods approved by DEQ, FWP, and BLM.  Results of the surveys shall be presented to the STATE INSPECTOR.
- Prior to the start of construction within three miles of a greater sage-grouse lek, the OWNER shall also conduct surveys to determine the peak number of male greater sage-grouse at leks identified by FWP and BLM more than three miles from the facility, for use as a baseline in determining whether construction activities or presence of the pipeline has affected greater sage-grouse numbers.
- Pipeline construction within three miles of active greater sage-grouse leks in suitable nesting habitat not screened by topography from March 1 to June 15 is prohibited with the following exceptions:
    a. The OWNER may pass equipment as a single group along the permitted right-of-way or approved location though a restricted lek buffer area.
    b. Equipment would only pass through a restricted lek buffer between 10:00 am and 2:00 pm, to avoid disturbing displaying birds during critical times of the day.
    c. If major grading is required to pass equipment along the permitted right-of-way or approved location, this grading would take place outside of the March 1 through June 15 restriction period.
    d. As the equipment passes through the areas, if any large hummocks or rocks impede the travel lane, the lead dozer would lower its blade on the way through to move the obstruction to the side and/or smooth out any larger hummocks or rocks.
- The OWNER shall conduct surveys of sharp-tailed grouse leks prior to construction using methods approved by DEQ in consultation with FWP, to detect leks that can be seen from the construction ROW and associated power lines. Results of the surveys shall be presented to the STATE INSPECTOR.

- Construction within 0.25 mile of active sharp-tailed grouse leks that can be seen from the construction ROW is prohibited from March 1 to June 15. This same timing restriction applies to routine maintenance. It does not apply when emergency maintenance or response is required for safe operation of the Project.
- The OWNER shall contact BLM and FWP to determine what mitigation measures are needed for a lek found within the construction ROW and implement those measures.
- In sagebrush habitat, the OWNER will reduce the mound left over the trench in areas where settling would not present a path for funneling runoff down slopes. In these areas additional measures shall be taken to compact backfilled spoils to reduce settling.
- The OWNER shall establish a compensatory mitigation fund to be used by DEQ, BLM, and FWP to enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species in eastern Montana. The size of the fund will be based on the acreage of silver sagebrush and Wyoming big sagebrush habitat disturbed during pipeline construction within greater sage-grouse core habitat mapped by FWP and important habitat between approximate mileposts 96.5 to 130.5. For each acre disturbed, the OWNER shall contribute $600 dollars to the fund.
- During operations, inspection flights shall be limited to afternoons from March 1 to June 15 as practicable in sage brush habitat designated by FWP (considering weather conditions and federal inspection requirements).
- The OWNER shall fund a study under the direction of DEQ, FWP, and BLM that would show whether the presence of the facility has affected greater sage-grouse numbers, based on the peak number of male greater sage-grouse in attendance at leks. For a period of four years, the agencies shall annually monitor, compare, and report the peak number of male greater sage-grouse at three leks within three miles of the pipeline that are not screened by topography, to the number of males in attendance at three leks more distant than three miles of the facility, before and after construction of the pipeline. At the end of this four year period, DEQ, FWP, and BLM will determine whether there has been a change in the number of male greater sage-grouse in attendance. If there is a decrease, the OWNER will be required to increase the numbers of greater sage-grouse elsewhere to offset the observed reductions. Documented greater sage-grouse population increases as a result of expenditures from the compensatory mitigation fund, above, may be used to fulfill this requirement.
- The OWNER shall implement reclamation measures (e.g., application of mulch or compaction of soil after broadcast seeding, and reduced seeding rates for non-native grasses and forbs) that favor the establishment of silver sagebrush and big sagebrush in disturbed areas, where compatible with the surrounding land use and habitats, unless otherwise requested by the affected LANDOWNER.
- Prior to construction, the OWNER shall conduct studies along the route to identify areas that support stands of big sagebrush and silver sagebrush and

incorporate these data into reclamation activities to prioritize re-establishment of sagebrush communities, as required above.

- Unless otherwise requested by the LANDOWNER, in areas supporting stands of big sagebrush and silver sagebrush, the OWNER shall monitor establishment of sagebrush on reclaimed areas annually for at least four years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities, and implement additional seeding or plantings of sagebrush if necessary. Reports of this monitoring activity shall be submitted to the DEQ annually.
- The OWNER and DEQ shall establish criteria in conjunction with FWP and BLM to determine when reclamation of sagebrush communities has been successful, based on the pre- and post construction studies described above. This shall not relieve the OWNER of its responsibility to meet the revegetation standards in Appendix B.
- Unless requested by the affected LANDOWNER, the OWNER shall use locally adapted sagebrush seed, collected within 100 miles of the areas to be reclaimed.
- To protect nesting for Sprague's pipit, a sensitive species in Montana, if construction would occur during the April 15 to July 15 grassland ground-nesting bird nesting season, nest-drag surveys must be completed by the OWNER to determine the presence or absence of nests on lands in Phillips and Valley counties, and implement timing restrictions recommended by USFWS and MFWP. Results of the surveys shall be presented to the STATE INSPECTOR.
- To minimize destruction of mountain plover nests and disturbance of breeding mountain plovers, no construction, reclamation, or other non-emergency ground disturbing activities will occur from April 10 to July 10, unless surveys conducted by the OWNER consistent with the Plover Guidelines or other methods approved by the USFWS find that no plovers are nesting in the area. Suitable mountain plover habitat in Fallon and northern and central Valley counties along the approved route must be surveyed three times between April 10 and July 10, with each survey separated by at least 14 days. The earlier date will facilitate detection of early-breeding plovers. If a nest is identified, construction activities within 0.25 mile of the nest shall be delayed for 37 days (typical fledging duration) or until fledging, whichever is sooner. If a brood of flightless chicks is identified, construction activities must be delayed for at least seven days or until fledging, whichever is sooner. Routine, non-emergency, maintenance activities shall be scheduled outside the April 10 to July 10 period in mountain plover habitat, unless surveys conducted by the OWNER indicate that no plovers are nesting in the area and that flightless chicks are not present. Results of surveys that detect mountain plovers shall be presented to the STATE INSPECTOR.
- The OWNER shall conduct pre-construction surveys for interior least tern within 0.25 mile from suitable breeding habitat at the Yellowstone River during the breeding season (April 15 to August 15 inclusive) to ensure that there are no nesting pairs within 0.25 mile of the construction area. Daily surveys for nesting

terns must be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat. Construction will not be permitted within 0.25 mile from an occupied nest site during the breeding season (April 15 through August 15) or until the fledglings have left the nesting area. Results of the surveys that detect least terns shall be presented to the STATE INSPECTOR.

- In Phillips and Valley counties where swift fox occur, den surveys shall be conducted by the OWNER between February 15 and July 31 and, if dens are found, construction activities within 500 m of an active swift fox den will not occur between February 15 and July 31. Swift fox potentially occur in Prairie, Dawson, and Fallon counties along the proposed route. Den surveys shall be conducted by the OWNER between February 15 and July 31 in Prairie, Dawson, and Fallon counties and if a den is found within 500 m of a facility or associated facility, construction will not occur between February 15 and July 31. Results of the surveys that detect swift fox dens shall be presented to the STATE INSPECTOR.
- Prior to and during construction, the OWNER shall conduct surveys for active bald eagle nests and communal roost sites prior to construction. If any of these are found, the OWNER shall implement the measures in the Montana Bald Eagle Management Plan or if this plan expires, then the OWNER shall use current guidance from the US Fish and Wildlife Service[1]. Results of the surveys that detect bald eagle nests or communal roost sites shall be presented to the STATE INSPECTOR.
- Prior to March 15 of each year of construction, the OWNER shall survey approved locations and nearby areas for the presence of golden eagle nests. If a golden nest is found, the OWNER shall restrict construction, reclamation, and non-emergency maintenance activities within 1000 m of the nest from March 15 until July 15, or until the young have fledged. Results of the surveys that detect golden eagle nests shall be presented to the STATE INSPECTOR.
- The OWNER will survey for the presence of ferruginous hawk nests. If an active nest is found, no construction, reclamation, or non-emergency maintenance activities will take place within 1000 m of the nest between March 15 and July 15, or until young have fledged.
- The OWNER will conduct surveys for nesting burrowing owls in Phillips, Valley, southern McCone, and southern Dawson counties during the period between April 15 and August 1. If nesting burrowing owls are found, no construction, reclamation, or non-emergency maintenance activities will occur within 500 m of an active nest until chicks have fledged. Results of surveys that detect ferruginous hawk nests shall be presented to the STATE INSPECTOR.

[1] Montana Bald Eagle Working Group. 2010. Montana Bald Eagle Management Guidelines: An Addendum to Montana Bald Eagle Management Plan, 1994, Montana Fish, Wildlife and Parks, Helena, Montana.

- The OWNER shall conduct surveys for nests of other raptor species not listed above. If an active nest is found, no construction and reclamation activities will occur within 1000 m between March 15 and July 15, or until the young have fledged. Results of the surveys shall be presented to the STATE INSPECTOR.
- Prior to each year of construction, the OWNER shall survey the approved corridor in Fallon County for black-tailed prairie dog colonies. When reasonably possible, construction within identified colonies that are large enough by themselves or in conjunction with other colonies to comprise essential Category 3 complexes should be avoided. Results of the surveys that detect raptor nests shall be presented to the STATE INSPECTOR.
- Great blue heron rookeries should be avoided by 500 feet.
- If a western hog-nosed snake or milksnake hibernaculum is found within the construction ROW during construction, then a construction timing restriction between October 1 and May 1 should be used at that site to prevent loss to a large number of individuals. The STATE INSPECTOR shall be informed of the location of any hibernacula found.
- To protect small animals from entanglement, erosion control netting shall not be composed of material with plastic netting with openings less than two inches across.
- In order to protect habitat of the Great Plains toad and plains spadefoot, no construction activity is allowed within 100 m of ephemeral wetlands from April 15 to July 15.
- Unless otherwise requested by the LANDOWNER in writing, the DEQ and the OWNER shall, for a period of five years following initial seeding, monitor cover and densities of native and non-native perennial forbs and perennial grasses exclusive of noxious weeds on reclaimed native prairie, pasture, and riparian areas. Native prairie and riparian areas must be reseeded with native forbs and grasses, while pastures must be reseeded with species approximating the existing vegetation exclusive of noxious weeds. Where densities and cover are not comparable to adjacent communities to achieve bond release per the criteria in Appendix B, the OWNER shall reseed the areas not meeting the bond release criteria in Appendix B unless specified in writing by the STATE INSPECTOR.
- The OWNER, working in conjunction with the LANDOWNER, shall appropriately manage livestock grazing of reclaimed areas until successful reclamation of sagebrush communities has been achieved, as described above.
- The OWNER shall implement measures to reduce or eliminate colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass, to the extent that these species do not exist in undisturbed areas adjacent to the right-of-way.
- During construction, when trenches are open, the OWNER shall conduct daily inspections to locate and remove animals that have been trapped in the open trench.

- Between June 1 and August 15, the OWNER shall conduct surveys in forested riaparian habitat using the methods described in the Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta (http://www.srd.alberta.ca/FishWildlife/WildlifeManagement/documents/Handbook-InventoryMethodsStandardProtocols-SurveyingBatsInAlberta-Dec06.pdf) to determine the location of bat (fringed myotis, *Myotis thysanodes*, long-eared myotis, *Myotis evotis*) maternity roosts and for Townsend's big-eard bat (*Corynorhinus townsendii*) roost trees. If found, disturbance of roosts should be avoided where possible until the bats have left the area in late summer or fall, and removal of roost trees should be avoided wherever practicable. Results of the surveys shall be presented to the STATE INSPECTOR.
- Tree clearing will be minimized through a narrowing of the construction ROW and final centerline location near crossings of certain streams identified in Appendix L of these specifications.
- Pre- and post construction monitoring plans should be developed for depressional wetlands of the Prairie Potholes region in Montana, and wetlands that no longer pond water after the pipeline is installed should receive additional compaction, replacement, or at the LANDOWNER's or managing agency's discretion compensatory payments should be made for drainage of the wetland.

Land Use

The OWNER shall bore irrigation ditch and canal crossings where requested by a LANDOWNER, to reduce the potential for canal seepage following construction.

Following construction or maintenance activities, crossings of leveled irrigated fields, ditches, canals, and border dikes shall be restored to a state that existed prior to construction. Changes in leveled irrigated field, canal, and dike grade over the pipeline trench as a result of soil settling shall be repaired by the OWNER at the first reasonable opportunity after such settling is observed by the OWNER, STATE INSPECTOR, or reported by the LANDOWNER. Leakage of canals, ditches, and dikes shall be restored as closely as practicable to a state that existed prior to construction. If further settling over the trench causes leakage from canals, ditches, or dikes, this leakage shall be repaired by the OWNER at the first reasonable opportunity after it is reported by the LANDOWNER.

Prior to construction, the OWNER will select, subject to DEQ approval, and the OWNER will pay for a public liaison officer to facilitate the exchange of information between the OWNER's contractors and employees, and LANDOWNERS, local communities, and residents, and to resolve promptly any complaints or problems that may develop for LANDOWNERS, local communities, and residents as a result of the pipeline. The liaison shall report to DEQ.

If during operations, settling or piping should occur on cultivated land, then the OWNER shall consult with a professional soil scientist or an appropriately qualified, licensed, professional engineer regarding the level of compaction and efficacy of ditch plugs. Repairs shall be made to limit the flow of water along the pipeline based on the recommendations of the soil scientist or professional engineer. Copies of the results shall be provided to the LANDOWNER. If complete restoration is not possible, the OWNER shall compensate the LANDOWNER for lost productivity. Nothing in this requirement shall limit the remedies available to a LANDOWNER under 75-20-405, MCA.

The OWNER will use existing soil survey data to locate probable areas where topsoil (i.e., the A horizon) deeper than 12 inches is likely to occur. The OWNER will confer with the NRCS and DEQ to determine if soil sampling is necessary to refine the soil characteristics in those areas, and to determine if additional soil salvage and handling procedures would be necessary to maintain equivalent productivity.

The OWNER will use existing soil survey data to locate areas where special soil handling procedures (such as triple-lift or over-stripping topsoil) would help preserve soil productivity and reclamation potential. Soil survey data will be analyzed by horizon to locate areas where lower soil horizons may contain high salt concentrations, fluvial gravels, or unconsolidated bedrock that are not present in surface or near surface horizons and thus could reduce revegetation success. The OWNER will base this analysis on criteria that are used in Canada for evaluating potential triple-lift soils. The OWNER will consult with the NRCS on the locations and characteristics of these soils, and on soil sampling procedures to refine soil mapping units where special handling procedures will be applied. The OWNER will provide the NRCS and DEQ with the results of this soils analysis and the locations where special soil handling procedures may be necessary.

If MTV-15 is selected, the OWNER shall mark and avoid the stock water tank in Township 7 North, Range 59 East, Section 35.

Appendix B: Bond

(The amount of the bonds will be determinate at the time of CERTIFICATION)

The amount of bond posted for performance during initial reclamation shall be $_____. The amount of bond for performance during the reclamation and revegetation period shall be $_____.

During initial reclamation, the bond will be held to help ensure compliance with the terms of the DEQ CERTIFICATE and these Environmental Specifications. Should the OWNER fail to comply with the terms of the CERTIFICATE or the Environmental Specifications, the OWNER would be subject to penalties listed in 75-20-408 MCA and the DEQ would access and expend the initial reclamation bond for the purpose of ensuring that the conditions of the CERTIFICATE are met.

The standards listed in Section 3.2.1 for reclamation and revegetation shall be used to determine release of the Reclamation and Revegetation Bond, or to determine that expenditure of the Reclamation and Revegetation Bond is necessary to meet the requirements of the CERTIFICATE, unless otherwise determined by the DEQ.

Appendix C: Names and Addresses
of the
STATE INSPECTORS and OWNER's Liaisons

The STATE INSPECTOR:

Montana Department of Environmental Quality
P.O. Box 200901, 1520 E. 6th Ave.
Helena, MT 59620-0901

Fax: 406-444-1499

E-mail address:

State Environmental Inspection Monitoring Contractors:

OWNER's Environmental Inspector's Phone List:

Spread 1-
Spread 2 -
Spread 3 -
Spread 4 -

Appendix D: Monitoring Plan

The STATE INSPECTOR is responsible for implementing this Monitoring Plan required by 75-20-303(b) and (c), MCA, and for reporting whether terms of the CERTIFICATE and Environmental Specifications (including but not limited to adequacy of erosion controls, successful seed germination, and areas where weed control is necessary) are being met, along with any conditions in the MPDES General Permit for Storm Water Discharges Associated with Construction Activity. Additional mitigating measures may be identified by the STATE INSPECTOR on Federal lands in order to minimize environmental damage due to unique circumstances that arise during construction.

In addition to participating in preconstruction conferences, the INSPECTORS shall conduct on-site inspections during the period of construction. At a minimum, the INSPECTORS will be present at the start of construction and during the initiation of construction in SENSITIVE AREAS. Subsequently, INSPECTORS shall strive to conduct on-site reviews of construction activities on at least a weekly schedule. More frequent monitoring may be necessary.

INSPECTORS shall record the dates of inspection, areas inspected, and instances where construction activities are not in conformance with Environmental Specifications or terms and conditions of the CERTIFICATE for the Project. Inspection reports shall be submitted in a timely manner to the OWNER's Liaison who will see that corrections are made or that such measures are implemented in a timely manner.

When violations of the CERTIFICATE are identified, the STATE INSPECTOR shall report the violation in writing to the OWNER, who shall immediately take corrective action. If violations continue, civil penalties described in 75-20-408, MCA may be imposed.

Upon the completion of construction in an area, the INSPECTORS will determine that Environmental Specifications have been followed, and that activities described in OWNER's application have been completed and revegetation is progressing in a satisfactory manner.

DEQ may obtain the assistance of FWP to monitor impacts on wildlife between the time of certification and the completion of construction, including improper harvest of wildlife by employees, contractors, or other agents of the OWNER on the ROW, access roads, routes, and areas adjacent thereto.

In the event the DEQ determines that the OWNER is not correcting damage created during construction in a satisfactory manner or that initial revegetation is not progressing satisfactorily, DEQ may determine the amount and disposition of all or a portion of the Reclamation Bond to correct any damage that has not been corrected by the CERTIFICATE holder.

State Owned Parcels

On land owned by the state of Montana, the DEQ's environmental inspectors will help determine whether conditions contained in easements across state lands are followed. If conditions are not being met, then DEQ inspectors will notify the appropriate DNRC regional office.

Weed Control

During the second and third growing seasons following the completion of restoration and reseeding, the OWNER and INSPECTORS will inspect the ROW and ACCESS ROADS for newly established stands of noxious weeds, to identify those areas where noxious weeds were not established prior to construction. The County Weed Control supervisor will be invited to attend this inspection. In the event that stands of weeds are encountered, appropriate control measures will be taken by the OWNER.

Spills

A STATE INSPECTOR will be named to coordinate DEQ response and monitoring of spills not pre-empted by federal authority. The STATE INSPECTOR will determine that recovery and cleanup efforts are complete, that impacts to the environment have been minimized when the nature and costs of various cleanup alternatives are considered, and that affected areas are adequately reclaimed. All DEQ monitoring costs shall be paid for by the OWNER.

Groundwater Monitoring Plan

In order to protect groundwater resources, the OWNER shall conduct pre- and post-construction monitoring of any wells or springs within 100 feet of the right-of-way. After the pipeline location has been approved, the OWNER would determine whether any wells or springs are within 100 feet of the right-of-way. The survey would be conducted by checking state well records, agency records, and personal communication with private LANDOWNERS and field review. Baseline field surveys of each well or spring would include a visual estimate of flow and water clarity, and field-measured temperature, electrical conductivity, and pH. The results of required surveys would be filed with the agencies before construction commences near these wells and springs.

After construction is complete, the wells and springs would be surveyed again for the same parameters to determine if construction has caused any impacts on the groundwater. If during construction any additional wells or springs are found within 100 feet of the right-of-way, the OWNER will sample these water sources, as described above. In the unlikely event that post-construction monitoring shows that construction had an adverse effect on the groundwater, the OWNER shall provide for an emergency potable water source, if needed, and provide for the necessary repairs, replacement, and/or relocation of the affected wells and springs to restore the supply system to its former capacity. If it is determined that there has been an impact on the quantity or quality of water available from a well or spring within 100 feet of the pipeline right-of-way as a result of pipeline construction or operation, then the OWNER will attempt to restore the well or spring to its original capacity, as determined in the pre-construction survey, using all reasonable efforts and typical well and/or spring restoration techniques.

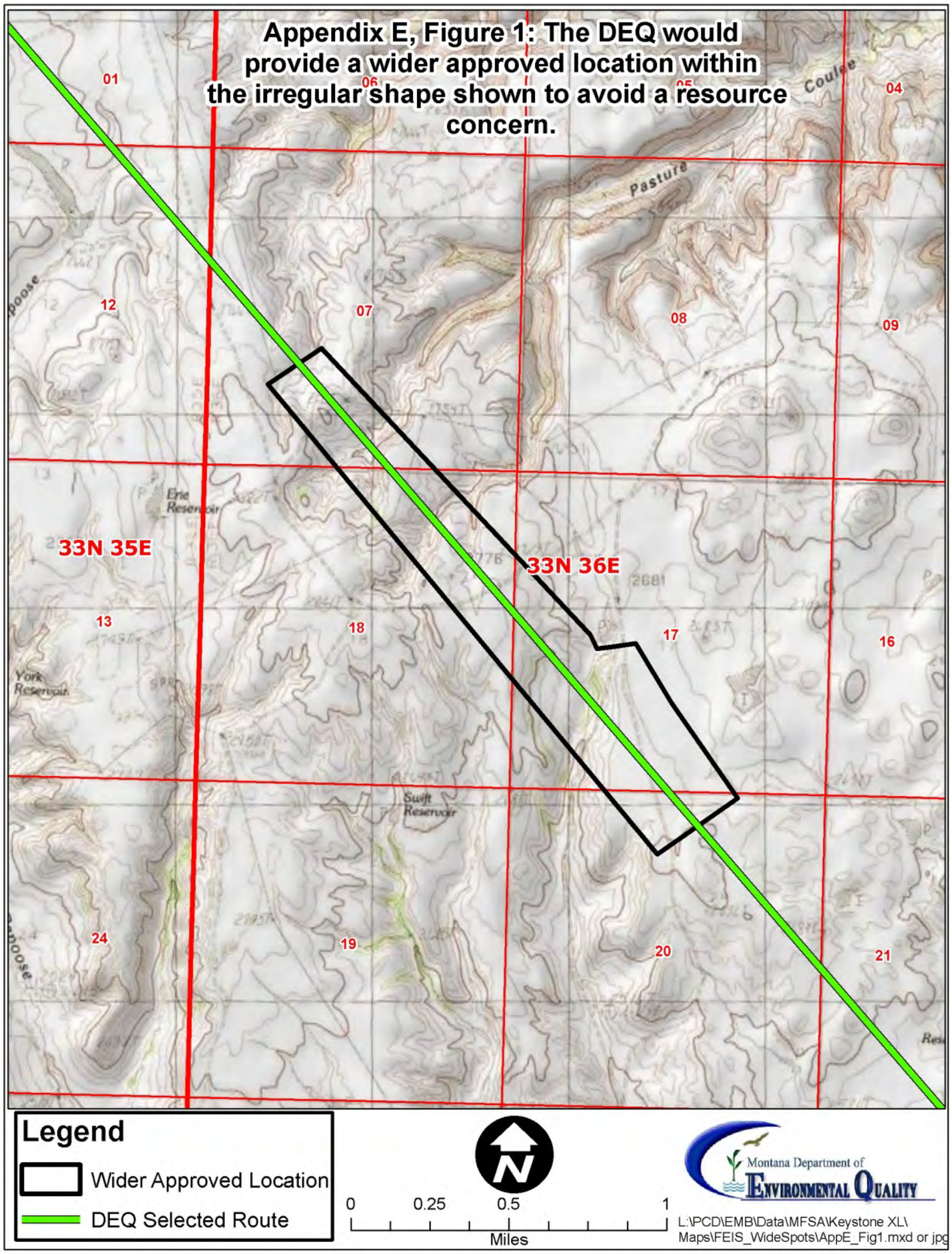
If a well cannot be returned to its original quality or capacity using all reasonable efforts and typical restoration techniques, the OWNER will install a new well to the LANDOWNER's reasonable satisfaction with characteristics similar to the well lost. If a spring cannot be returned to its original quality or capacity using all reasonable efforts and typical restoration techniques, the OWNER will install a new well to replace the spring as determined by mutual agreement between the OWNER and the LANDOWNER and/or water right holder; and negotiate with the LANDOWNER and/or water right holder appropriate damages.

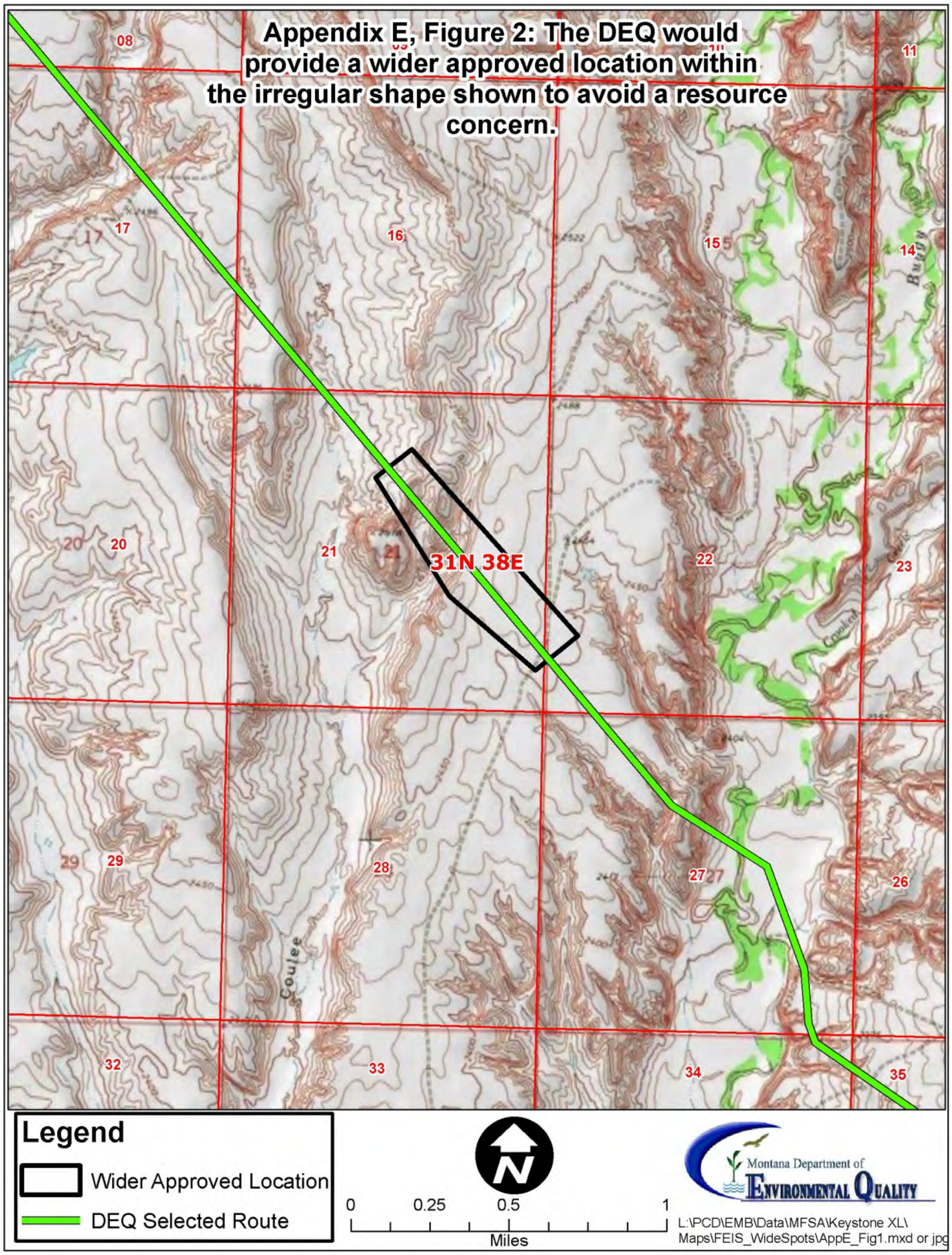
If it is not technically feasible after using all reasonable efforts to install a new well either at an existing or mutually agreeable alternate location, then the OWNER will negotiate with the LANDOWNER and/or water right holder appropriate damages to compensate for such loss.

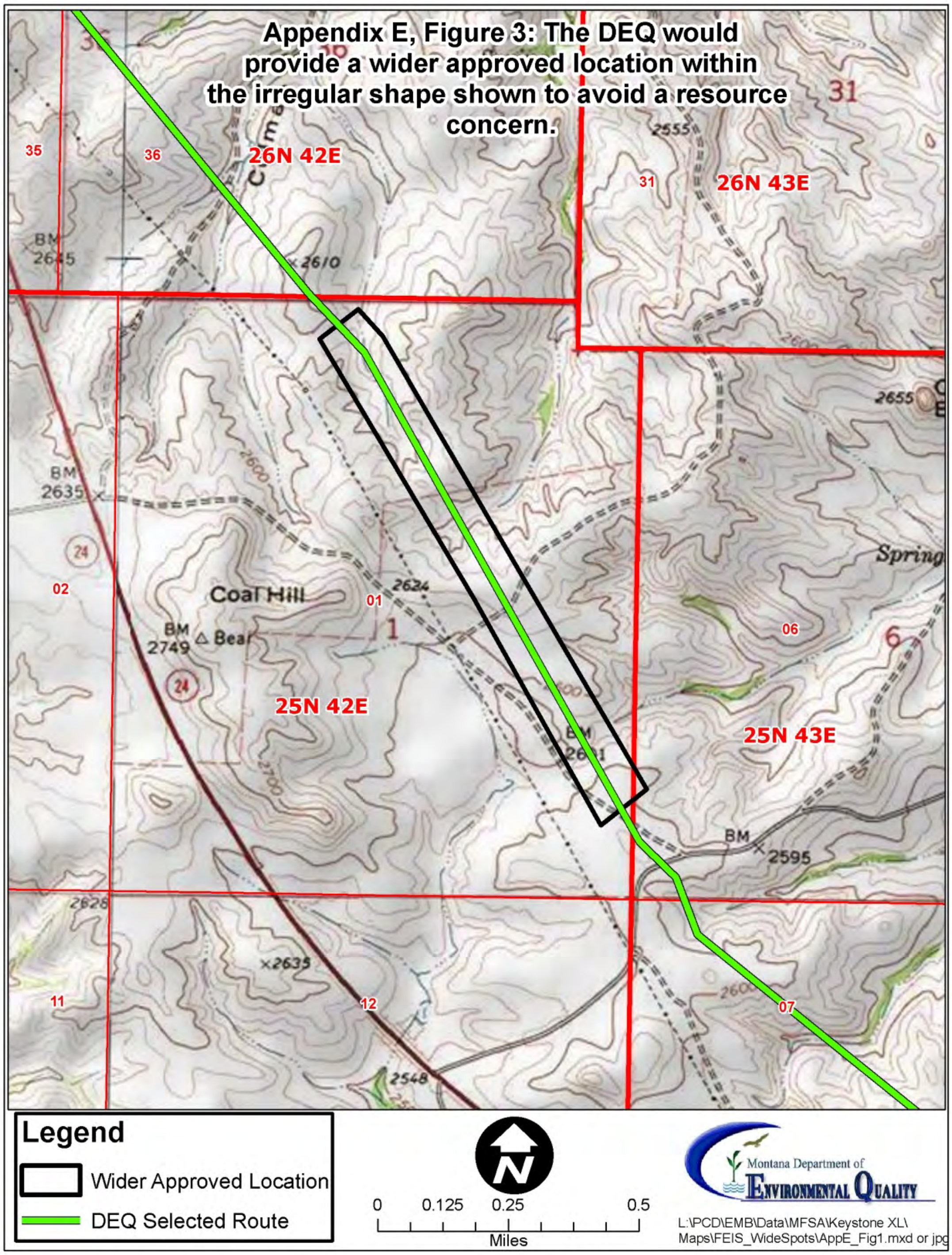
Prior to commencement of construction, the Monitoring Plan, including the Ground Water Monitoring Plan, must be approved by DEQ.

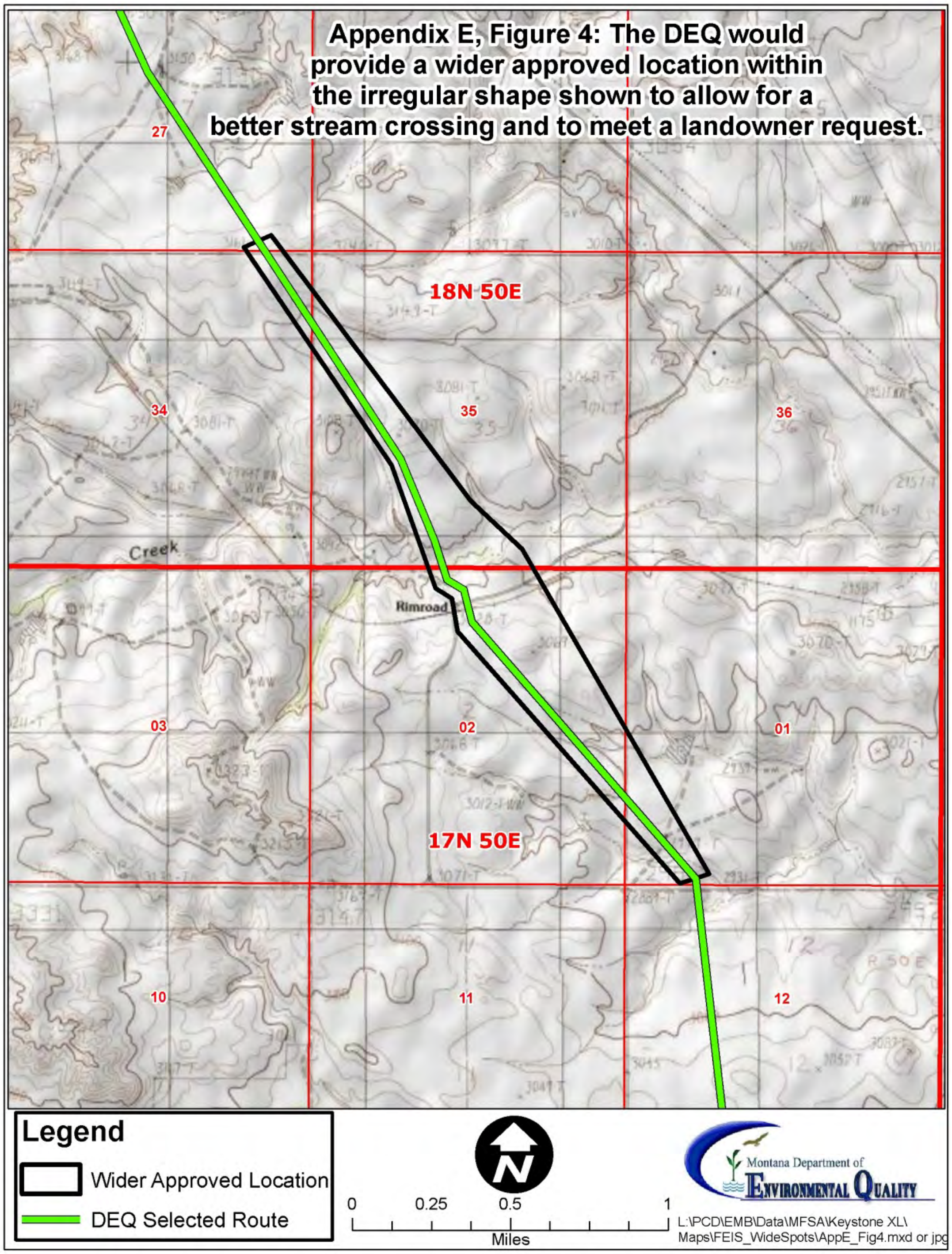
## Appendix E:  Variations in Approved Locations

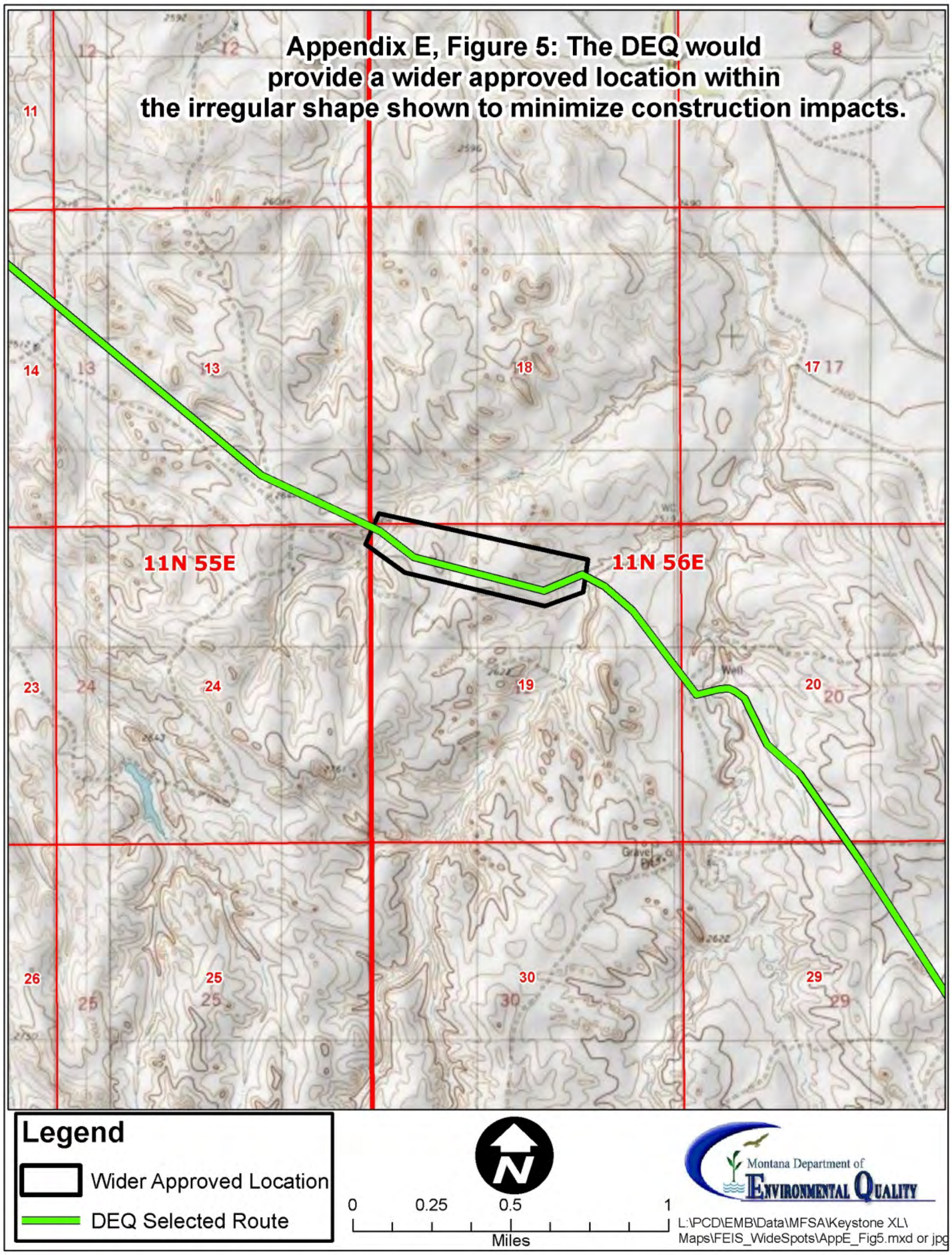
The approved locations shall be 250 feet on either side for the referenced centerline indicated on the maps included with the CERTIFICATE, except as noted below. Construction activities shall be conducted in the minimum area necessary for safe and prudent construction, in accordance with these specifications and indicated in TransCanada Keystone, L.P.'s (the OWNER) Major Facility Siting Act Application as amended prior to issuance of a Certificate of Compliance.  In the areas indicated on the following maps, variations in the width of the approved location are granted to reduce impacts.  Construction of the Project would occur within the areas shown on the attached maps.


Appendix E, Figure 1: The DEQ would provide a wider approved location within the irregular shape shown to avoid a resource concern.
01
06
05
04
12
07
08
09
33N 35E
33N 36E
13
18
17
16
24
19
20
21
Eric Reservoir
York Reservoir
Swift Reservoir
Pasture
Coulee
Legend
Wider Approved Location
DEQ Selected Route
0
0.25
0.5
1
Miles
Montana Department of Environmental Quality
L:\PCD\EMB\Data\MFSA\Keystone XL\ Maps\FEIS_WideSpots\AppE_Fig1.mxd or jpg


Appendix E, Figure 2: The DEQ would provide a wider approved location within the irregular shape shown to avoid a resource concern.
08
11
17
16
15
14
20
21
31N 38E
22
23
29
28
27
26
32
33
34
35
Coulee
Legend
Wider Approved Location
DEQ Selected Route
0
0.25
0.5
1
Miles
Montana Department of
Environmental Quality
L:\PCD\EMB\Data\MFSA\Keystone XL\
Maps\FEIS_WideSpots\AppE_Fig1.mxd or jpg


Appendix E, Figure 3: The DEQ would provide a wider approved location within the irregular shape shown to avoid a resource concern.
26N 42E
26N 43E
25N 42E
25N 43E
35
36
31
02
01
06
11
12
07
Coal Hill
BM 2749 Bear
BM 2645
BM 2635
2610
2624
2555
2655
BM 2595
2628
2635
2548
Spring
Legend
Wider Approved Location
DEQ Selected Route
0
0.125
0.25
0.5
Miles
Montana Department of Environmental Quality
L:\PCD\EMB\Data\MFSA\Keystone XL\Maps\FEIS_WideSpots\AppE_Fig1.mxd or jpg


Appendix E, Figure 4: The DEQ would provide a wider approved location within the irregular shape shown to allow for a better stream crossing and to meet a landowner request.
18N 50E
17N 50E
27
34
35
36
03
02
01
10
11
12
Creek
Rimroad
Legend
Wider Approved Location
DEQ Selected Route
0
0.25
0.5
1
Miles
Montana Department of
Environmental Quality
L:\PCD\EMB\Data\MFSA\Keystone XL\
Maps\FEIS_WideSpots\AppE_Fig4.mxd or jpg



Appendix E, Figure 5: The DEQ would provide a wider approved location within the irregular shape shown to minimize construction impacts.
11N 55E
11N 56E
Legend
Wider Approved Location
DEQ Selected Route
0
0.25
0.5
1
Miles
Montana Department of Environmental Quality
L:\PCD\EMB\Data\MFSA\Keystone XL\Maps\FEIS_WideSpots\AppE_Fig5.mxd or jpg

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Appendix F:  Hydrostatic Test Discharge Plan

(To be approved by DEQ prior to beginning of testing.)

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# APPENDIX G of ATTACHMENT 1

Information in this appendix is no longer current and has been removed.

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# MEMORANDUM OF UNDERSTANDING FOR PALEONTOLOGICAL RESOURCE INVESTIGATIONS ON THE MONTANA PORTION OF THE KEYSTONE XL PIPELINE PROJECT

**WHEREAS**, in February 2010, the Montana Department of Environmental Quality (DEQ) received a complete application for a certificate of compliance from TransCanada Keystone Pipeline, LP (Keystone) for the portion of the Keystone XL Pipeline Project that is proposed to be constructed in Montana, hereinafter referred to as the Project. Keystone is required to obtain a certificate of compliance from DEQ prior to construction of the Project under the Major Facility Siting Act (MFSA); and

**WHEREAS,** the Area of Potential Effects (APE) for the Project includes a 300 foot-wide survey area that includes a 110-foot-wide construction corridor for the proposed pipeline as approved by DEQ. Finally, the APE includes all areas that are directly affected by construction of proposed pumping stations, stockpile yards, and other associated facilities; and

**WHEREAS**, the U.S. Department of State (DOS) is the lead federal agency responsible for administering the National Environmental Policy Act, the Endangered Species Act, and the National Historic Preservation Act; and

**WHEREAS**, the Bureau of Land Management (BLM), in accordance with the Federal Land Policy and Management Act (FLPMA 1976) is required to minimize adverse impacts on natural, environmental, scientific, cultural and other resources and values on federal land. Instruction Memorandum (IM) 2009-011 requires BLM to assess and mitigate potential impacts to paleontological resources on federal land; and

**WHEREAS**, DEQ is the lead state agency responsible for administering the Montana Environmental Policy Act and MFSA prior to issuance of a certificate of compliance; and

**WHEREAS,** the Montana Department of Natural Resources and Conservation (DNRC), in accordance with the Montana State Antiquities Act (Section 22-3-421, *et seq.*, M.C.A.), is required, in part, to assess and mitigate potential adverse effects to paleontological remains on agency managed state land; and

**WHEREAS**, the Montana State Historic Preservation Office (SHPO) in accordance with the Montana State Antiquities Act (Section 22-3-423(7), M.C.A.) shall cooperate and assist local, state, and federal government agencies in comprehensive planning that allows for the preservation of paleontological resources; and

**WHEREAS**, the Programmatic Agreement (PA) developed under Section 106 of the National Historic Preservation Act (NHPA) for the Keystone XL Project will maintain precedence over this MOU in regards to the identification and evaluation of paleontological resources that may have Traditional Cultural Property (TCP) value; and

**WHEREAS**, DEQ has consulted with the BLM, DOS, DNRC, SHPO and Keystone to secure concurrence with the terms of this Memorandum of Understanding; and

**WHEREAS,** the Bureau of Reclamation, National Park Service and the U.S. Corps of Engineers were invited to consult in the development of this Memorandum of Understanding and have declined to participate;

**NOW THEREFORE**, the following terms and conditions will govern the consideration of paleontological resources that may be affected by the Project.

**STIPULATIONS AND METHODS OF INVESTIGATION:**

1) Keystone has completed most of the paleontological record searches and survey work using BLM paleontological resource management guidelines (BLM Manual H-8270-1; BLM IM 2008-009; BLM IM 2009-011) using the services of a permitted and qualified paleontologist.
2) Keystone shall use the services of a qualified paleontologist (BLM Manual H 8270-1; IM 2009-011) to gather and evaluate information concerning the existence and location of paleontological resources within the APE as needed.
3) Where required, Keystone shall submit a written request under ARM 17.20.804(2) to conduct a paleontological literature and file search with the Montana SHPO for a one (1) mile wide area (0.5 mile on either side of the centerline) of the route and associated facility locations as defined by 75-20-104(3)(a), M.C.A., prior to conducting field surveys. Keystone shall conduct a concurrent file search with the appropriate field offices of the BLM and with the DNRC for state-owned lands.
4) Keystone's paleontological consultant shall continue to maintain a valid BLM Paleontological Resources Use Permit and any other permits required under federal or state law.
5) Where surveys have not been completed, Keystone shall complete a pedestrian survey prior to construction. Keystone shall conduct the pedestrian survey at an intensity required under BLM IM 2009-011.
6) Keystone shall monitor construction in those portions of the APE with unknown, moderate, high, and very high paleontological potential (classes 3a, 3b, 4, or 5) based on the Potential Fossil Yield Classification System (PFYC). Areas of very low to low potential (1 or 2) will not be subject to pedestrian survey. Areas of moderate potential (3a), if discovered, will be spot checked only. Areas with unknown potential (if any) (3b), and with high and very high potential (4 and 5) will be subject to a 100% pedestrian survey of bedrock exposures. Existing access roads that have been "crowned and ditched" do not need to be surveyed.
7) Keystone shall record and evaluate paleontological resources located in the APE on the forms and within the standards specified in the Montana SHPO

Planning Bulletin No. 21, as well as BLM Manual H-8270-1, BLM IM 2008-009, and BLM IM 2009-011.

8) Keystone shall evaluate paleontological resources located within the APE for scientific significance as outlined in the BLM IM 2009-011. In areas that have been previously inventoried in which the agency with jurisdiction is satisfied with the work, no additional inventory is required.
9) Prior to DEQ's issuance of a certificate of compliance, Keystone will draft and submit for agency review and approval, a comprehensive Paleontological Resources Mitigation Plan that describes: 1) the measures developed in consultation with the consulting parties to minimize and mitigate the adverse effects of the Project's construction activities on paleontological resources; 2) the manner in which these measures will be carried out; 3) a schedule for their implementation; and 4) how paleontological discoveries within each spread planned for Montana will be handled. The Paleontological Resources Mitigation Plan will be included within Keystone's Plan of Development and DEQ's Environmental Specifications.

    a. Keystone will make a reasonable and good faith effort to complete implementation of the Paleontological Resources Mitigation Plan approved by the cooperating agencies prior to beginning construction of any spread. If it is not possible to meet this schedule, Keystone will develop a Coordination Plan that establishes how appropriate treatment will be determined and implemented during construction of the respective spread.

    b. The Mitigation Plan will specify the precise locations within the Project APE where monitoring is required, and will describe procedures for fossil salvage and paleontological data recordation for non-extensive, isolated scientifically significant fossil discoveries. These types of discoveries are anticipated to be the most common during the course of construction as is typical during pipeline construction projects, and they can be quickly documented and collected with minimal construction delays. The Mitigation Plan will include agency or land owner notification procedures as appropriate, and procedures that construction personnel should follow in the event that an unexpected fossil discovery is made in an area that is not monitored by a paleontologist. The Mitigation Plan will also include procedures to be followed in the event of an extensive paleontological discovery as described in "c" below.

    c. Extensive paleontological discoveries are defined as discoveries that are unanticipated and cannot be quickly mitigated due to their large size and/or complexity (e.g., partial or complete associated dinosaur skeleton or extensive vertebrate microfossil accumulation). For extensive paleontological discoveries, a Locality-Specific Paleontological Mitigation Plan will be developed and approved by the pertinent agency and SHPO. The Locality-Specific Paleontological Mitigation Plan will identify the specific research questions to be addressed with an explanation of their scientific significance, the paleontological methods to be used, and provisions for curation, public interpretation and education, subject to confidential restrictions, if any.

d. Keystone will submit the draft Locality Specific Paleontological Mitigation Plan to consulting parties for a seven (7) working day review. Keystone shall address timely comments and recommendations submitted by consulting parties in preparation of the draft Locality Specific Paleontological Mitigation Plan.

e. When it has addressed all of the comments and recommendations, Keystone will submit the Final Locality Specific Paleontological Mitigation Plan to all consulting parties and carry out the recommended mitigative measures.

10) BLM, DEQ, SHPO, DNRC, and DOS will provide information in their possession regarding paleontological materials to aid the other agencies in satisfaction of their respective responsibilities.
11) All parties to this agreement will have jurisdiction of paleontological resources identified on lands which they manage. All parties to this agreement will be invited to comment on all paleontological resources identified as a result of this agreement.

Execution of this Memorandum of Understanding by BLM, SHPO, DEQ, DNRC, DOS, and Keystone evidences that all parties have reviewed and commented upon the terms and conditions guiding the paleontological resource investigation for the Keystone XL Pipeline Project within the state of Montana.

**MEMORANDUM OF UNDERSTANDING**
**FOR PALEONTOLOGICAL RESOURCE INVESTIGATIONS**
**ON THE MONTANA PORTION OF THE KEYSTONE XL PIPELINE PROJECT**

| | |
|---|---|
| U.S. Bureau of Land Management | Date |
| U.S. Department of State | Date |
| TransCanada Keystone XL Pipeline, L.P. | Date |
| Montana State Historic Preservation Office | Date |
| Montana Dept. of Environmental Quality | Date |
| Montana Dept. of Natural Resources and Conservation | Date |

Appendix I: Rehabilitation Plan
Erosion Control, Reclamation, and Revegetation Plan

The erosion control, reclamation, and revegetation procedures to be followed by the OWNER are detailed in the Montana Storm Water Pollution Prevention Plan for Keystone XL Pipeline Project construction activities.

Appendix J: Areas Where Additional Restrictions in the Timing of Construction Apply

The timing of construction activities at stream crossings will not occur during spring runoff.

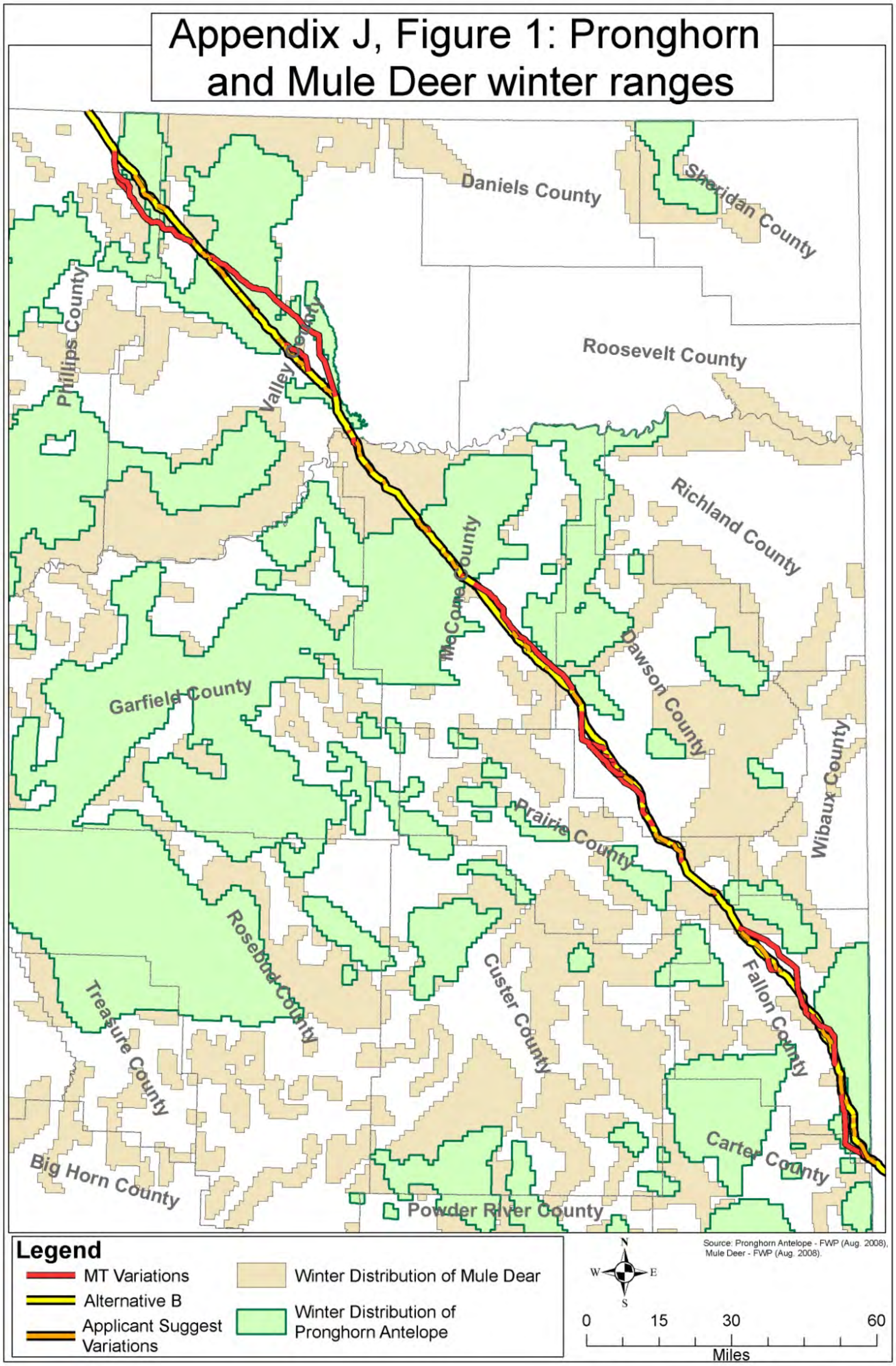
Within big game winter ranges shown on Figure 1, the STATE INSPECTOR may impose timing restrictions if construction activities extend beyond November 15. In these areas, the STATE INSPECTOR will determine the need for restrictions based upon the severity of winter conditions and consultation with FWP biologists.

Other restrictions on the timing of construction are required in Section 2.3.2 and 2.3.3 of these specifications for excessively wet conditions.

Timing restrictions for grouse and other species are described in Appendix A.

Prior to construction, the OWNER shall submit a Winterization Plan and implement the plan if winter conditions prevent reclamation completion until spring. This plan will be updated by the OWNER as field conditions change during construction and updates will be provided to the STATE INSPECTOR. In order to insure backfilled materials are adequately compacted, construction will not occur when spoils and soils are frozen, unless otherwise permitted by the STATE INSPECTOR. If there is more than six inches of snow or ice within the trench, then that segment of trench will not be backfilled until snow or ice has been removed or melted, unless otherwise agreed in writing to by the affected LANDOWNER. This written approval will be provided to the STATE INSPECTOR.

If winter conditions are encountered during final reclamation, final reclamation may be delayed until the following spring, unless otherwise agreed to by the affected LANDOWNER in writing. A copy of such a written agreement will be provided to the STATE INSPECTOR. In either case, the standards listed in Section 3.2 shall be used to judge the success of reclamation.



Appendix J, Figure 1: Pronghorn and Mule Deer winter ranges
Daniels County
Sheridan County
Roosevelt County
Phillips County
Valley County
Richland County
McCone County
Dawson County
Garfield County
Wibaux County
Prairie County
Rosebud County
Custer County
Fallon County
Treasure County
Carter County
Big Horn County
Powder River County
Legend
MT Variations
Alternative B
Applicant Suggest Variations
Winter Distribution of Mule Dear
Winter Distribution of Pronghorn Antelope
Source: Pronghorn Antelope - FWP (Aug. 2008), Mule Deer - FWP (Aug. 2008).
N
W
E
S
0
15
30
60
Miles

Appendix K:  Noxious Weed Management Plan

Final locations of wash or cleaning stations will be indicated below after a route is selected by DEQ but prior to the start of construction.

Table K-1.  Noxious Weed Wash or Cleaning Station Sites and Potential Water Sources for Wash or Cleaning Stations in Montana

| Wash/Cleaning Station | Location | Milepost | Direction of Work | Water Sources |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

## Appendix L: Requirements at Stream Crossings

At stream crossings the OWNER shall calculate the depth of scour based on a 100-year flood event and the size of sediment found at the crossing. The OWNER shall bury the pipeline below this calculated depth to help ensure that floods and lateral channel movement do not expose the pipeline over its lifetime. The burial depth shall be extended laterally as approved by DEQ after field inspection of the crossing site. For streams where horizontal directional drill crossings would not occur, crossings must be conducted during low flows prior to or following spring runoff.

As required in Section 2.10.3 of these Environmental Specifications, at least 30 days prior to constructing the facility or associated facilities at a perennial stream crossing or stream containing a fish species of special concern, DEQ shall conduct an on-site inspection of the crossing. The purpose of the inspection shall be to determine the final location of the crossing, the crossing method, width and depth of burial to be used, and site-specific reclamation measures. The following parties shall be invited to attend this inspection: representatives for the OWNER, FWP, representatives of the local conservation district(s), and the LANDOWNER or land management agency.

DEQ began these inspections in October of 2010 and other inspections are expected to occur in 2011 or 2012 if the Project is approved. Note that in addition to perennial streams, several intermittent streams with sizeable drainage areas above the proposed crossings were examined in October. The following notes summarize the results of the 2010 inspections. Site-specific plans must still be submitted for these streams by the OWNER's representatives.

The winter of 2010-2011 resulted in higher than normal low elevation snowpack in Eastern Montana. Rains during the spring of 2011 added to snow melt, causing flooding along many of the streams and rivers crossed by the proposed Project. Consequently DEQ and the OWNER will jointly recheck channel morphology at each crossing examined in 2010 and make adjustments necessary as determined by DEQ to minimize impacts.

In the following stream specific discussions, various burial depths are specified. These burial depths at stream crossings take into account the calculated depth of stream channel erosion and scour that may occur in a flood event. Most of these burial depths are deeper than required by federal regulations. Burying the pipeline below scour depth helps to prevent future construction activities in and near streams to rebury the pipeline should it be exposed. The burial depths described below assume that alluvial materials are encountered. If bedrock is encountered during construction, the pipeline would be buried to a minimum of two feet below the top of the bedrock surface.

Note that the mile postings described below may change based on final route selection. Similarly, final route selection may negate the need to cross certain streams and additional inspections could be necessary on other streams.

Unless otherwise noted, dam and pump or dam and flume methods will be used to construct the crossings if water is present at the time of construction.

Date: Oct. 19, 2010
Stream Name: Rock Creek
Approximate Milepost: 39.1
FWP fisheries value class: 3

Are special status fish or amphibians present? No records were found in FWP's MFISH database and no special status species were observed during the inspection, but pearl dace have been reported.

If so, timing of spawning and rearing? Not applicable (NA).

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? Burial depth would be eight feet below the minimum thalweg elevation (the low point in the stream channel cross section).

What is the width of deep burial to avoid pipeline exposure due to stream meander? Increased burial depth should be maintained for at least 125 feet from the base of the steep bank on the north side of Rock Creek to above the low bank (beyond the cottonwood tree located downstream of the crossing) on the south side of the stream crossing.

How will streambanks be stabilized following construction? Bank hardening with riprap is not allowed. During initial reclamation following construction disturbance, erosion control blankets are to be installed on the stream on the streambanks and the stream banks are to be revegetated. If channel migration occurs in the future beyond the 125 feet deep burial, the pipeline would be lowered in place to protect it from exposure.

Should clearing of riparian or wetland vegetation be minimized? Yes, minimize the clearing of riparian and wetland vegetation to the extent reasonably possible, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, reduce the ROW width at the approaches to the crossing to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves recommended? No.

Is equipment cleaning required before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW.

Will construction dewatering be necessary?  Possibly.

Will hydrostatic test water be diverted from this stream or river?  NA (not applicable).

Are there any site specific issues or mitigating measures?  Main line equipment is to cross the creek on a temporary bridge.

Are rookeries present within 500 M of the crossing?  None were observed during the inspection.

Date: Oct. 19, 2010
Stream Name: Willow Creek
Approximate Milepost: 40.5
FWP fisheries value class: 4

Are special status fish or amphibians present? No records of special status fish or amphibians were found in FWP's MFISH database for this stream and no special status species were observed during the inspection, but pearl dace have been reported.

If so, timing of spawning and rearing? NA.

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? Burial depth would be at least eight feet below the minimum thalweg elevation.

What is the width of deep burial to avoid pipeline exposure from stream meander? This deeper burial would be maintained for approximately 100 feet from the base of the tall west bank to the southeast.

How will streambanks be stabilized following construction? No bank hardening with riprap is allowed. Erosion control blankets are to be installed during initial reclamation on stream banks. In addition, stream banks are to be planted with willow sprigs installed to just below the water table on each side of the creek. The disturbed stream banks also are to be reseeded.

Should clearing of riparian or wetland vegetation be minimized? Yes, to the extent possible, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves recommended? No.

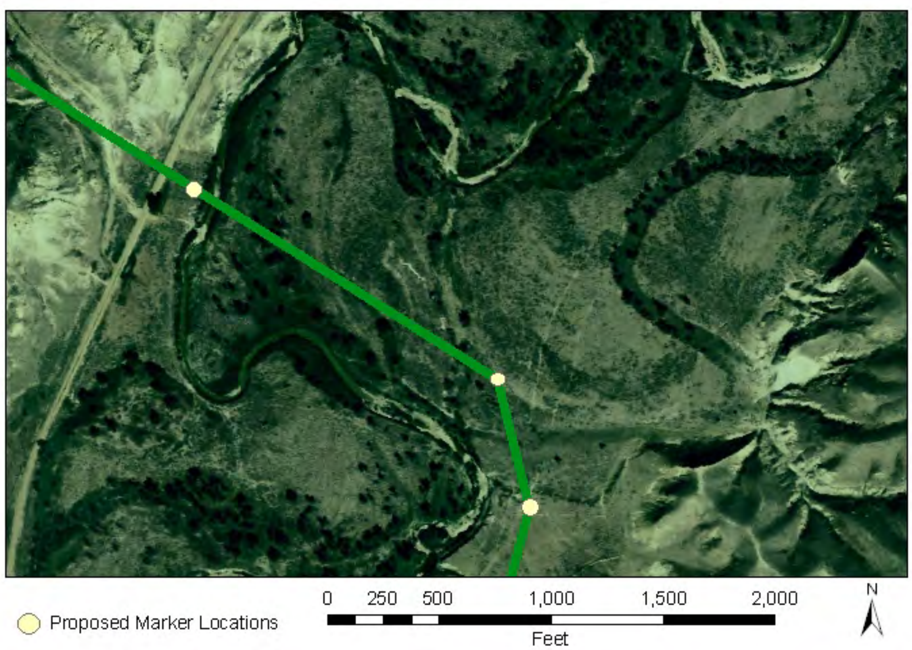
Is equipment cleaning required before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW.

Will construction dewatering be necessary? Possibly.

Will hydrostatic test water be diverted from this stream or river? Not applicable.

Are there any site specific issues or mitigating measures? Main line equipment is to cross the creek on a temporary railroad bridge. In the past, Willow Creek has meandered across most of the valley. In case the stream should begin to meander during the life of the pipeline, the pipeline could be exposed beyond the area slated for deep burial. To monitor this possibility, aerial markers are to be added on west bank, another about 1,500 feet east of the crossing at the turn in the pipeline, and a third about 600 feet further south, as shown on the attached figure. The location of these markers may change if MTV-3 is selected. The stream channel and pipeline location (indicated between markers) would be monitored from the air or ground to determine if stream meander is taking place that would threaten the pipeline. If monitoring indicates stream meander may encroach on the pipeline, the pipeline would be lowered in place to ensure its integrity.

Are rookeries present within 500 M of the crossing? Rookeries were not observed during the inspection.



Date: Oct. 19, 2010
Stream Name: Milk River
Approximate Milepost: 83
FWP fisheries value class: 1

Are special status fish or amphibians present? Yes.

If so, timing of spawning and rearing? Spring-early summer.

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? Depth of scour is estimated to be six feet below the minimum thalweg elevation. Horizontal directional drills are proposed to be about 40 feet below the thalweg, well below scour depth.

What is the width of deep burial to avoid pipeline exposure from stream meander? See the drawing of the crossing. The drilled crossing would be about 1,234 feet long from about 580 feet north of the Milk River to about 600 feet south of the river.

How will streambanks be stabilized following construction? Because this crossing is proposed as a horizontal directional drill, the streambanks should not be disturbed by pipeline construction.

Should clearing of riparian or wetland vegetation be minimized? Yes, to the extent possible, recognizing that the set up for a horizontal directional drill will need more space in the riparian zone than a conventional crossing.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, to the extent possible, recognizing that the set up for a horizontal directional drill will need more space in the riparian zone than a conventional crossing.

Are additional valves needed? Valves north and south of the river are proposed and located with a spacing that meet special condition requirements and provide adequate protection to the nearby downstream public water supply. No additional valves are required.

Is equipment cleaning required before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW. Canada thistle and leafy spurge is present so equipment must be cleaned before moving away from the drill area.

Will construction dewatering be necessary? Unlikely.

Will hydrostatic test water be diverted from this stream or river? Not applicable.

Are there any site specific issues or mitigating measures? Main line equipment is to cross the river on a temporary bridge that would span the river or use existing bridges nearby. This temporary bridge may require off ROW access. Approaches to the temporary bridge will likely require grading, and these disturbances are to be reclaimed and revegetated.

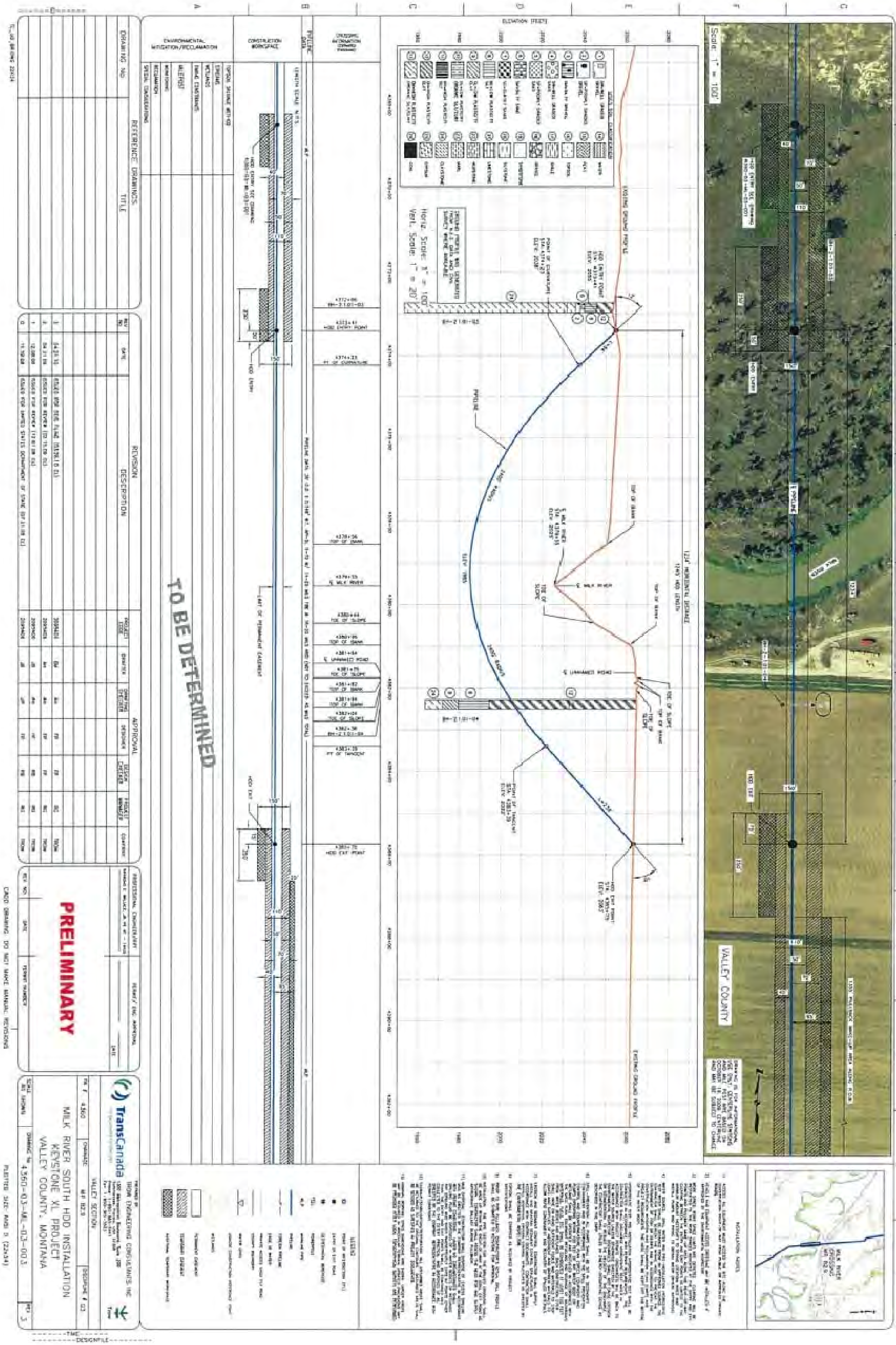
Valley County's floodplain administrator has indicated the proposed pipeline would have no adverse effects on the Milk River floodplain (Shipp 2011). If future channel migration occurs beyond the deep burial zone associated with the drilled crossing, the pipeline would be lowered in place or a new drill conducted to prevent pipeline exposure.

All drilling mud and cuttings are to be disposed of in a manner that they will not reach or be transported by runoff to state waters.

Are rookeries present within 500 M of the crossing? None were observed during the inspection.

Reference:

Shipp, Cameron. 2011. Letter dated February 16, 2011 from Cameron Shipp, Valley County Floodplain administrator, to Dan Nebel, professional geologist, Terracon Consultants, Inc. Billings.


TO BE DETERMINED
PRELIMINARY
TransCanada
MILK RIVER SOUTH HDD INSTALLATION
KEYSTONE XL PROJECT
VALLEY COUNTY, MONTANA
VALLEY COUNTY
REFERENCE DRAWINGS
REVISION
APPROVAL

Date:  Oct. 19, 2010
Stream Name:  Missouri River
Approximate Milepost:  89
FWP fisheries value class:  1

Are special status fish or amphibians present?  Yes.

If so, timing of spawning and rearing?  Spring-early summer.

Are special timing restrictions needed?  No.

What is the depth of burial based on stream channel scour calculations?  Depth of scour is estimated to be five feet below the minimum thalweg elevation.  A horizontal directional drill is proposed to be about 37 feet below the thalweg, well below scour depth.

What is the width of deep burial to avoid pipeline exposure from stream meander?  See the drawing of the crossing.  The drilled crossing would be about 2,482 feet long, including the recommended extension of the drill another 450 feet on the south side of the river to place the pipeline well below a high water channel located there.

How will streambanks be stabilized following construction?  Bank hardening with riprap is not allowed.  The entry and exit points for the horizontal directionally drilled crossing should be located outside the likely stream channel meander zone.

Should clearing of riparian or wetland vegetation be minimized?  Yes, clearing of trees and shrubs is to be minimized to the extent possible, recognizing that the set up for a horizontal directional drill will need more space in the riparian zone than a conventional crossing.  The entry/exit point on the south side of the river should be south of the cottonwood trees associated with the high water channel, to preserve these trees.

Should the right of way width be reduced at the approaches to the stream crossing?  Yes, to the extent possible, recognizing that the set up for a horizontal directional drill will need more space in the riparian zone than a conventional crossing.

Are additional valves required?  Yes, an additional motor operated block valve is required on the north side of the Missouri River at either approximate milepost 87.3 or 88.6 and an additional check valve is required on the south side of the Missouri River at approximate milepost 90.1.

Is equipment cleaning required before and after work in stream due to presence of exotic species?  Equipment is to be cleaned and dried prior to moving to the ROW and before leaving the drill side on the south side of the river.

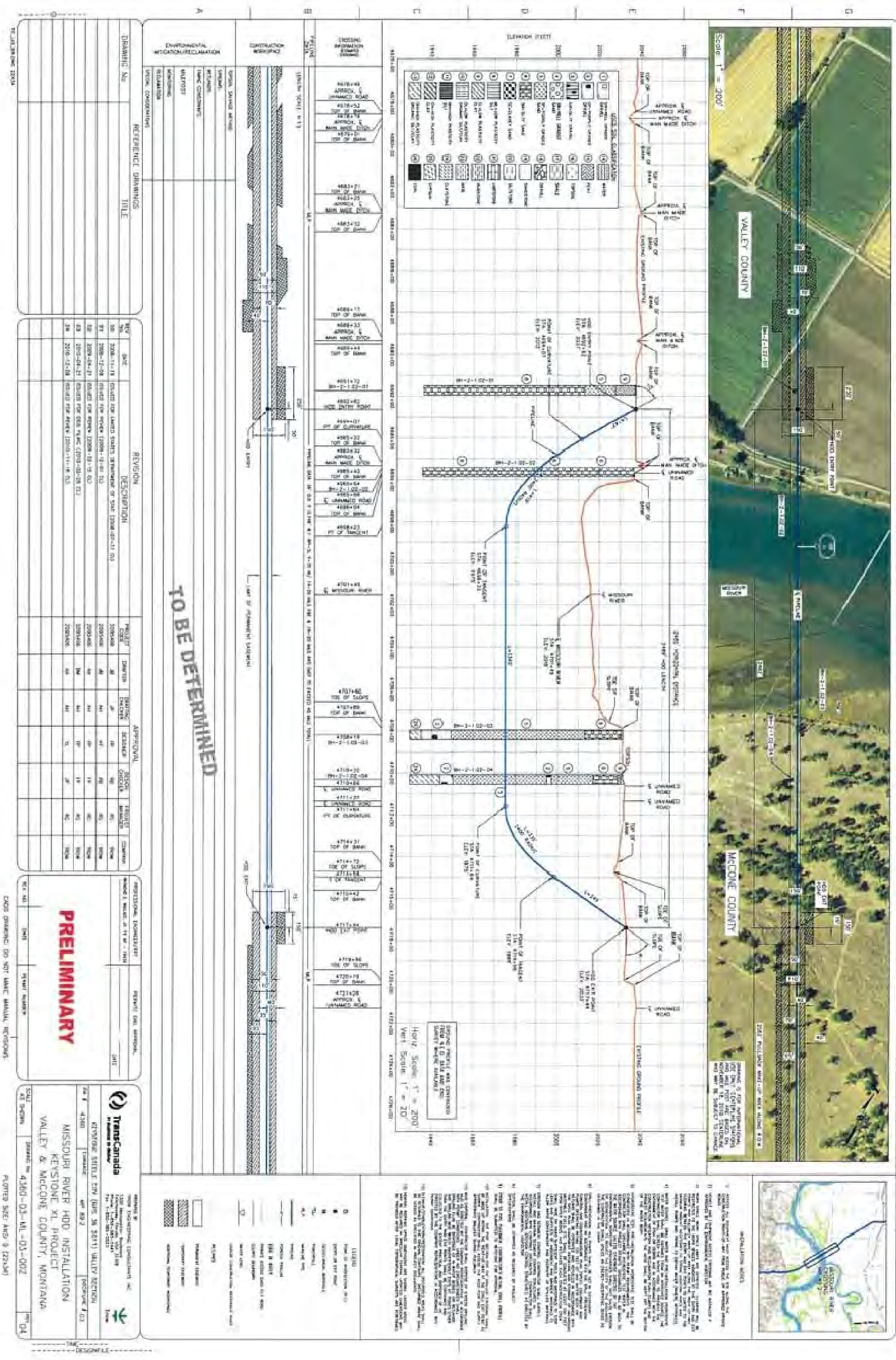
Will construction dewatering be necessary?  Construction dewatering is unlikely.

Will hydrostatic test water be diverted from this stream or river? Yes. The diversion rate for hydrostatic testing is not yet determined. Keystone will have to apply for and obtain a water use permit from the Department of Natural Resources and Conservation. Recognize that Montana Fish, Wildlife, and Parks holds an instream flow reservation that may restrict the time and rate at which water is diverted from the Missouri River.

Are there any site specific issues or mitigating measures? Main line equipment must drive around this crossing on existing roads.

All drilling mud and cuttings are to be disposed of in a manner that they will not reach or be transported by runoff to state waters.

Are rookeries present within 500 M of the crossing? None were observed during the inspection.


VALLEY COUNTY
McCONE COUNTY
TO BE DETERMINED
PRELIMINARY
TransCanada
MISSOURI RIVER HDD INSTALLATION
KEYSTONE XL PROJECT
VALLEY & McCONE COUNTY, MONTANA
4360-03-ML-03-002

Keystone XL Pipeline:
Missouri River
New Valve Locations
at Approx. Milepost 87.3
or 88.6 and 90.1
MP 81.3
Motor Operated Valve
MP 83.9
Check & Manual
Operated Valve
MP 87.3
Motor Operated Valve
MP 88.6
Motor Operated Valve
MP 90.1
Check & Manual
Operated Valve
MP 98.4
Motor Operated
Valve
Nashua
MILK RIVER
MISSOURI RIVER
Fort Peck
Dam Spillway
Fort Peck
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
Legend
Milepost
MDEQ's Required Valves
KXL's Valve Location
0 1 2 4
Miles
Montana Department of
Environmental Quality

Date: Oct. 20, 2010
Stream Name: Strupel Coulee Tributary
Approximate Milepost: 93.9
FWP fisheries value class: The stream is not rated. This is a very small intermittent stream with almost no water flowing at the time of the inspection.

Are special status fish or amphibians present? No records were found in FWP's MFISH database and no special status species were observed during the inspection.

If so, timing of spawning and rearing? NA.

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? A five foot burial depth below the minimum thalweg elevation is proposed to take into account head cutting observed in the drainage.

What is the width of deep burial to avoid pipeline exposure from stream meander? The five foot burial depth is to be maintained for at least 30 feet total, extending about 15 feet on each side of the stream channel.

How will streambanks be stabilized following construction? Bank hardening with riprap is not allowed. During initial reclamation following construction disturbance, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized? Yes, to the extent possible, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan. Save as many of the large shrubs as possible. Flag the larger trees as save trees.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves needed? No.

Is equipment cleaning required before and after work in the stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW.

Will construction dewatering be necessary? Possibly.

Will hydrostatic test water be diverted from this stream or river? Not applicable.

Are there any site specific issues or mitigating measures? Main line equipment is to cross the creek on a temporary bridge.

Rookeries present within 500 M of the crossing? None were observed during the inspection.

Date:  Oct. 20, 2010
Stream Name:  Jorgenson Coulee Tributary
Approximate Milepost:  94.9
FWP fisheries value class:  Not rated.  No flowing water was present at the time of the inspection.

Are special status fish or amphibians present?  No records were found in FWP's MFISH database and no special status species were observed during the inspection.

If so, timing of spawning and rearing?  NA.

Are special timing restrictions needed?  Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations?  The pipeline would be buried five feet below the bottom of the scour hole on the downstream side of the construction ROW.

What is the width of deep burial to avoid pipeline exposure from stream meander?  The five foot burial depth below the thalweg would be maintained across the valley bottom for about 40 feet total, beginning 15 feet from the north side of the creek and extending 25 feet on the south side.

How will streambanks be stabilized following construction?  Bank hardening with riprap is not allowed.  During initial reclamation following construction disturbance, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized?  Yes, clearing is to be minimized to the extent possible by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.  Flag and save as many of the green ash trees as possible.

Should the right of way width be reduced at the approaches to the stream crossing?  Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves needed?  No.

Is equipment cleaning required before and after work in stream due to presence of exotic species?  Equipment is to be cleaned and dried prior to moving to the ROW.

Will construction dewatering be necessary?  Possibly.

Will hydrostatic test water be diverted from this stream or river?  Not applicable.

Are there any site specific issues or mitigating measures? Main line equipment is to cross the creek on temporary matting or, if flowing water is present, on a temporary bridge.

Are rookeries present within 500 M of the crossing? None were observed during the inspection.

Date:  Oct. 20, 2010
Stream Name:  East Fork Prairie Elk Creek (close to the original crossing location just southwest of a deep pool).
Approximate Milepost:  125
FWP fisheries value class:  5.  Flowing water was not present at the time of the inspection.

Are special status fish or amphibians present?  No records were found in FWP's MFISH database and no special status species were observed during the inspection.

If so, timing of spawning and rearing?  NA.

Are special timing restrictions needed?  Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations?  Burial depth would be eight feet below the minimum thalweg elevation (the low point in the stream channel cross section).

What is the width of deep burial to avoid pipeline exposure from stream meander?  Increased burial depth would be extended for approximately 70 feet across the low channel bottom.

How will streambanks be stabilized following construction?  Bank hardening with riprap is not allowed.  During reclamation, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized?  Yes, to the extent possible by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing?  Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves recommended?  No.

Is equipment cleaning required before and after work in stream due to presence of exotic species?  Equipment is to be cleaned and dried prior to moving to the ROW.

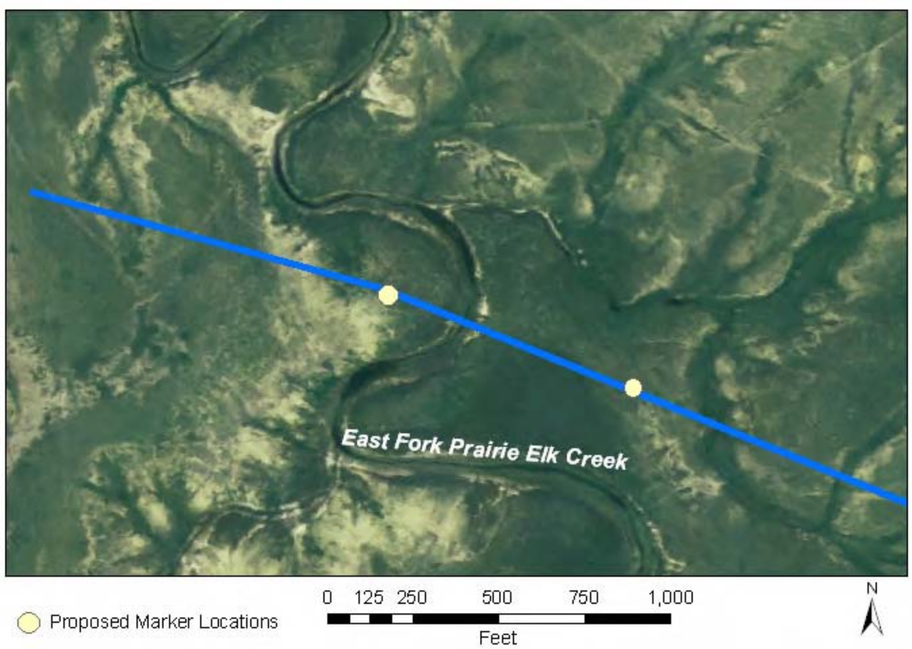
Will construction dewatering be necessary?  Possibly.

Will hydrostatic test water be diverted from this stream or river?  Not applicable.

Are there any site specific issues or mitigating measures? Main line equipment is to cross the creek on temporary matting if flowing water is not present. If flowing water is present, then equipment would use a temporary bridge. Do not use the MTV-5 alignment as this puts the crossing at the deepest point in the pool, making a dam and pump or dam and flume crossing more difficult.

Add aerial markers on the east and west sides of the creek, as shown on the attached figure. Using these markers, the crossing would be monitored from the air during regularly scheduled aerial inspections, or if necessary from the ground, to determine if stream meander is taking place. If monitoring indicates stream meander may encroach on the pipeline, the pipeline would be lowered in place below scour depth to ensure its integrity.

Are rookeries present within 500 M of the crossing? None were observed.



Date: Oct. 22, 2010

Stream Name: Redwater River. Note that during the field inspection the crossing alignment was adjusted, as noted on the attached figure, to avoid a tall stream bank. The new stream crossing location will be visited and surveyed in spring 2011 to establish revised burial recommendations.

Approximate Milepost: 147
FWP fisheries value class: 2

Are special status fish or amphibians present? Yes.

If so, timing of spawning and rearing? Spring/summer.

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? Burial depth based on the original MTV-6 location was estimated to be 10 feet below the minimum thalweg elevation (the low point in the stream channel cross section). The location will be visited and surveyed in spring 2011 to establish revised burial recommendations.

What is the width of deep burial to avoid pipeline exposure from stream meander? The revised crossing site would be visited in the spring of 2011 to establish revised burial recommendations.

How will streambanks be stabilized following construction? Bank hardening with riprap is not allowed. During initial reclamation, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized? Yes, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves recommended? No.

Is equipment cleaning necessary before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW.

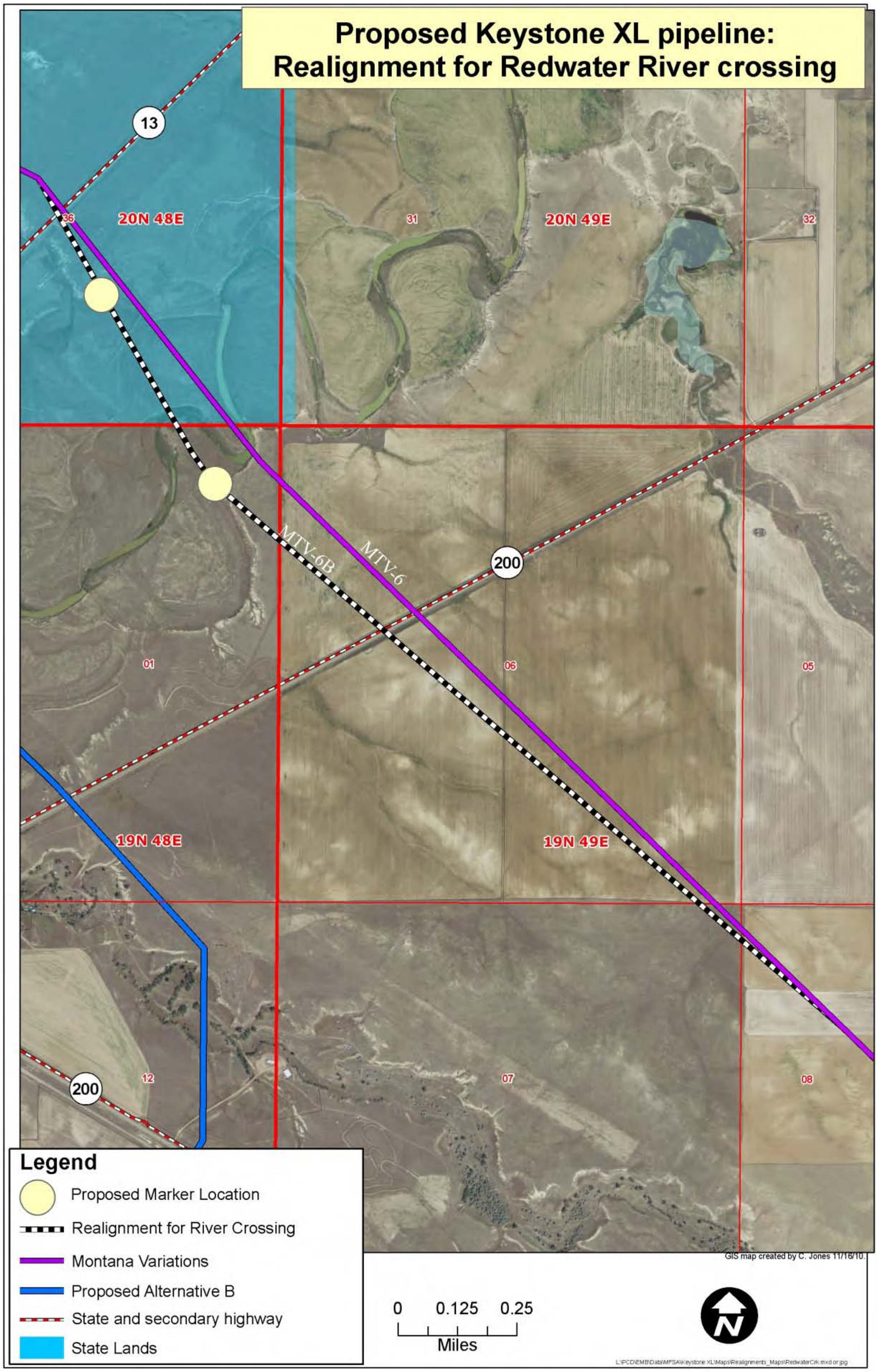
Will construction dewatering be necessary? Probably.

Will hydrostatic test water be diverted from this stream or river? Not applicable.

Site specific issues/mitigations? During the field inspection the crossing of Redwater River crossing was moved about 500 feet upstream, as shown on the attached figure, to avoid a 20 foot vertical bank on the south side of the river. Main line equipment is to cross the stream on a temporary bridge near the revised crossing location. The bridge would span the stream. To avoid crossing at a wide pool where spanning may not be possible, this equipment crossing may be outside the construction ROW.

Aerial markers are to be installed outside the stream channel meander zone so that air surveys that occur about every other week can determine whether channel movement could expose the pipeline. If channel movement looks as though it is progressing toward the pipeline, then the pipeline would be lowered below scour depth to prevent exposure.

Are rookeries present within 500 M of the stream crossing? None were observed.


Proposed Keystone XL pipeline:
Realignment for Redwater River crossing
13
20N 48E
20N 49E
31
32
36
MTV-6B
MTV-6
200
01
06
05
19N 48E
19N 49E
12
07
08
200
GIS map created by C. Jones 11/16/10.
Legend
Proposed Marker Location
Realignment for River Crossing
Montana Variations
Proposed Alternative B
State and secondary highway
State Lands
0 0.125 0.25
Miles

Date:  Oct. 21, 2010
Stream Name:  Berry Creek.  Note that this crossing would not be used if MTV-6 is selected.
Approximate Milepost:  159.6
FWP fisheries value class:  5.  Flowing water was <u>not</u> present at the time of the inspection.

Are special status fish or amphibians present?  No records were found in FWP's MFISH database and no special status species were observed during the inspection.

If so, timing of spawning and rearing?  NA.

Are special timing restrictions needed?  Other than constructing the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations?  The pipeline would be buried five feet below the minimum thalweg elevation.

What is the width of deep burial to avoid pipeline exposure due to stream meander? Increased burial depth would be extended for approximately 90 feet across the swale, from the base of the hill to the base of the opposite hill.

How will streambanks be stabilized following construction?  Bank hardening with riprap is not allowed.  During initial reclamation following construction disturbance, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized?  Yes, to the extent possible, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing?  Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.  Try to avoid the steep, unvegetated, near-vertical bank on the north valley wall to increase the chances for successful revegetation.

Are additional valves recommended?  No.

Is equipment cleaning required before and after work in the stream due to presence of exotic species?  Equipment is to be cleaned and dried prior to moving to the ROW. Canada thistle is present so equipment needs to be cleaned after constructing the crossing at this unnamed tributary.

Will construction dewatering be necessary?  Probably.

Will hydrostatic test water be diverted from this stream or river?  Not applicable.

Are there any site specific issues or mitigating measures?  Main line equipment is to cross the creek on temporary timber matting on supports.  Plant trees at the base of the vertical bank on the south valley side, just upstream from the crossing site, to help stabilize the bank and help prevent bank erosion that may expose the pipeline.

Rookeries present within 500M?  None were observed.

Date:  Oct. 21, 2010
Stream Name:  Clear Creek at realignment
Approximate Milepost:  175.6
FWP fisheries value class:  3.  Flowing water was not present at the time of the inspection.

Are special status fish or amphibians present?  No special status species were observed during the inspection.

If so, timing of spawning and rearing?  NA.

Are special timing restrictions needed?  Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations?  Burial depth would be six feet below the minimum thalweg elevation (the low point in the stream channel cross section).

What is the width of deep burial to avoid pipeline exposure from stream meander?  Deep pipeline burial would be maintained from the base of the high bank on the south side of the creek to the field edge north of the channel for approximately 40 feet total.

How will streambanks be stabilized following construction?  Bank hardening with riprap is not allowed.  During initial reclamation following construction disturbance, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized?  Yes, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing?  Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves needed?  No.

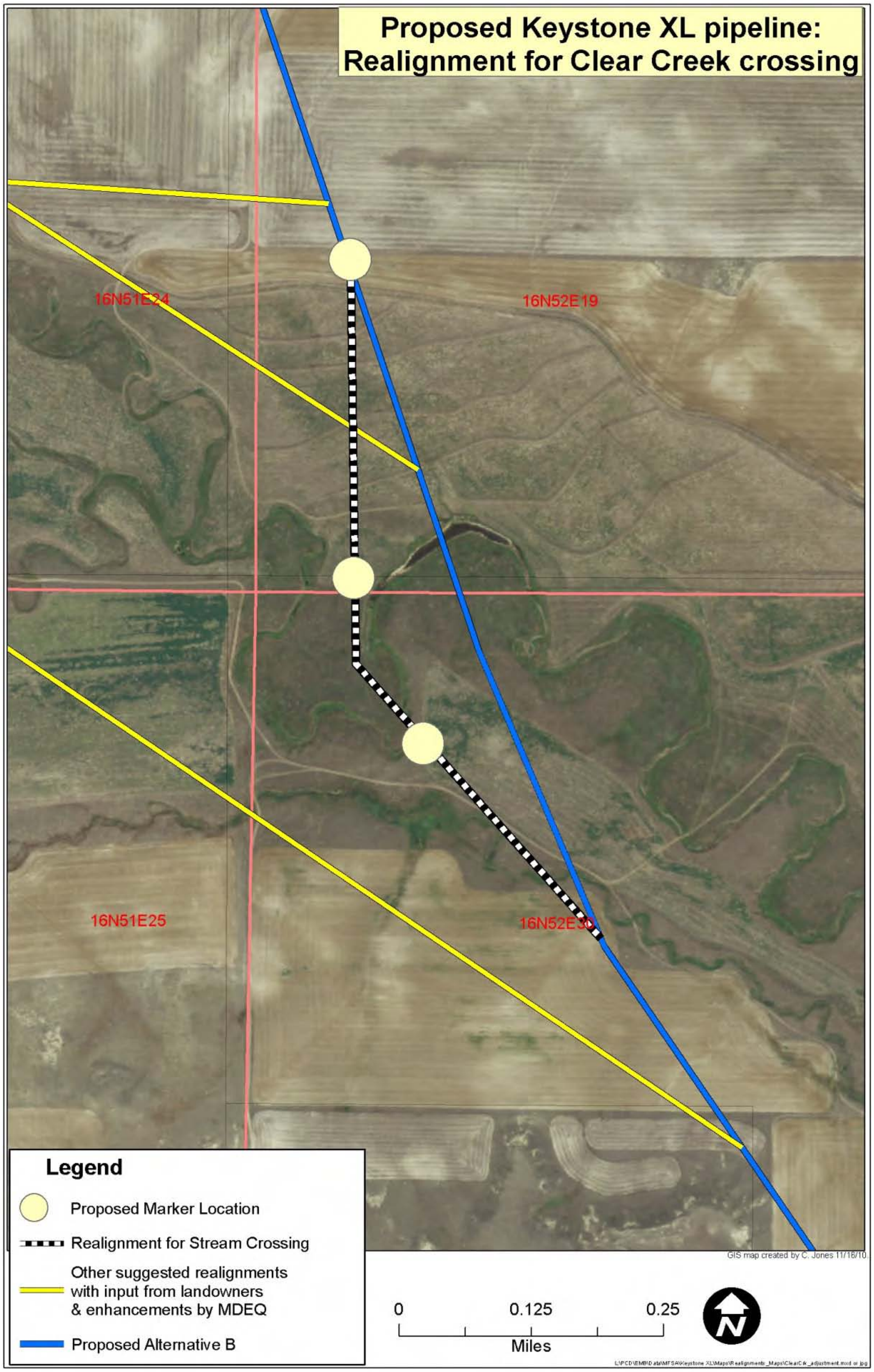
Is equipment cleaning required before and after work in the stream due to presence of exotic species?  Equipment is to be cleaned and dried prior to moving to the ROW.  Canada thistle is present so equipment needs to be cleaned before moving from the construction area.

Will construction dewatering be necessary?  Probably.

Will hydrostatic test water be diverted from this stream or river?  Not applicable.

Site specific issues/mitigations?  This crossing was moved about 600 feet to the west in order to avoid a deep pool and developed spring, as shown on the attached figure.  Main line equipment is to cross the creek on a temporary bridge that would span the creek. Aerial markers are to be installed over the centerline on the field boundary south of the creek and at the two fence lines north of the crossing.  Using these markers, the crossing would be monitored from the air or, if necessary, from the ground to determine if stream meander is taking place.  If monitoring indicates stream meander may encroach on the pipeline, the pipeline would be lowered in place below scour depth to ensure its integrity.

Are rookeries present within 500 M of the crossing?  None were observed.


Proposed Keystone XL pipeline:
Realignment for Clear Creek crossing
16N51E24
16N52E19
16N51E25
16N52E30
Legend
Proposed Marker Location
Realignment for Stream Crossing
Other suggested realignments
with input from landowners
& enhancements by MDEQ
Proposed Alternative B
0
0.125
0.25
Miles
GIS map created by C. Jones 11/16/10.

Date: Oct. 21, 2010
Stream Name: Yellowstone River
Approximate Milepost: 196
FWP fisheries value class: 1

Are special status fish or amphibians present? Yes.

If so, timing of spawning and rearing? Spring-early summer.

Are special timing restrictions needed? None.

What is the depth of burial based on stream channel scour calculations? Depth of scour is estimated to be five feet below the minimum thalweg elevation. A horizontal directional drill is proposed to be about 55 feet below the thalweg, well below scour depth.

What is the width of deep burial to avoid pipeline exposure from stream meander? See the drawing of the crossing. The drilled crossing would be about 3,200 feet long, extending below the high water channel on the north side of the river as well as the main channel.

How will streambanks be stabilized following construction? No bank stabilization is anticipated due to the horizontal directional drill.

Should clearing of riparian or wetland vegetation be minimized? The entry points will be outside the riparian zones.

Should the right of way width be reduced at the approaches to the stream crossing? NA.

Are additional valves required? Yes. The motor actuated block valve on the north side of the Yellowstone River must be moved from approximately milepost 195.5 to approximately milepost 196.5, as indicated on the attached figure. An additional check valve must be added on the south side of the Yellowstone River at approximate milepost 197.4, as shown on the attached figure.

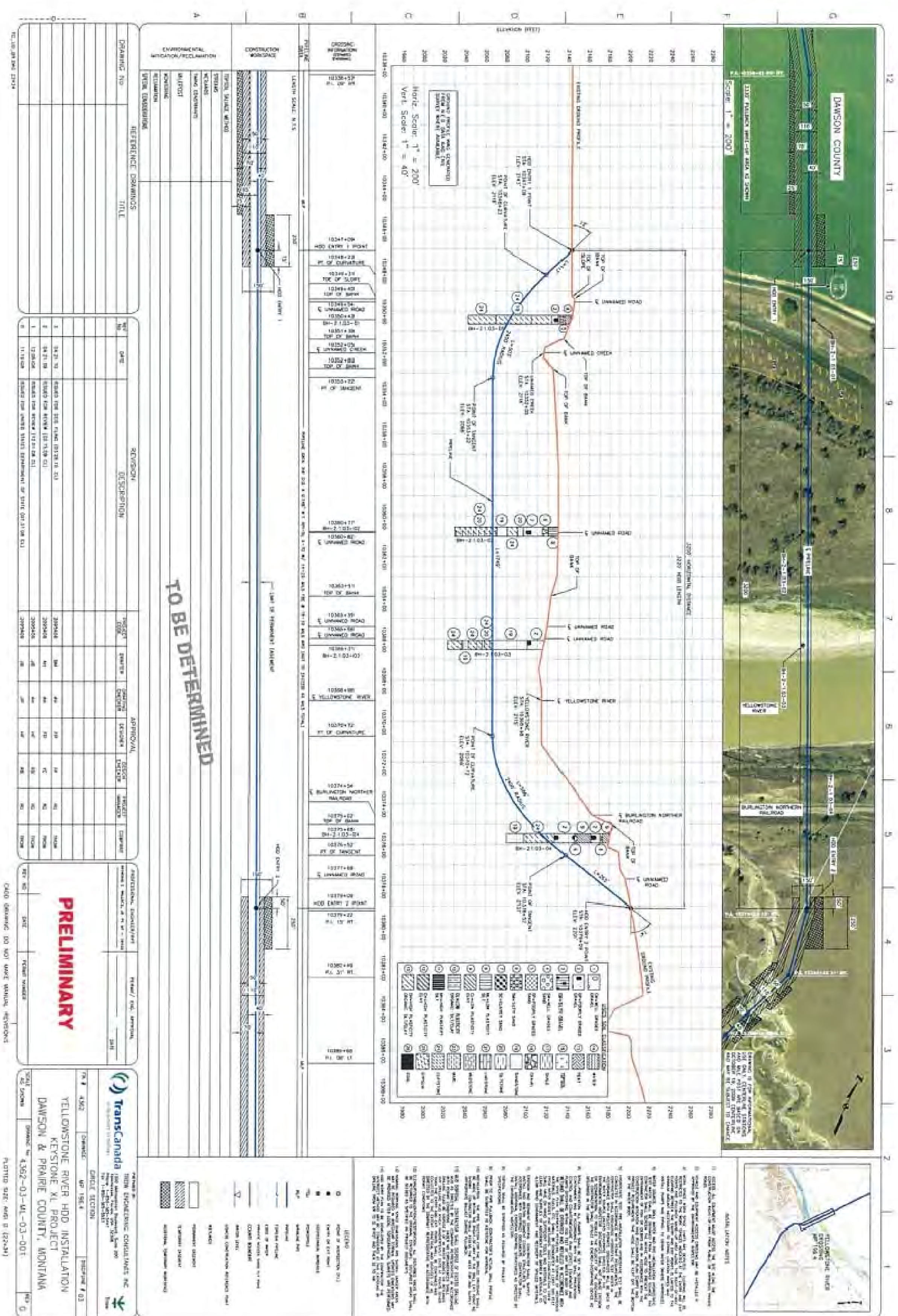
Is equipment cleaning required before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW. Leafy spurge is present in the uncultivated area on the north side of the river so any equipment or pumps used during hydrostatic testing in this area must be cleaned before leaving.

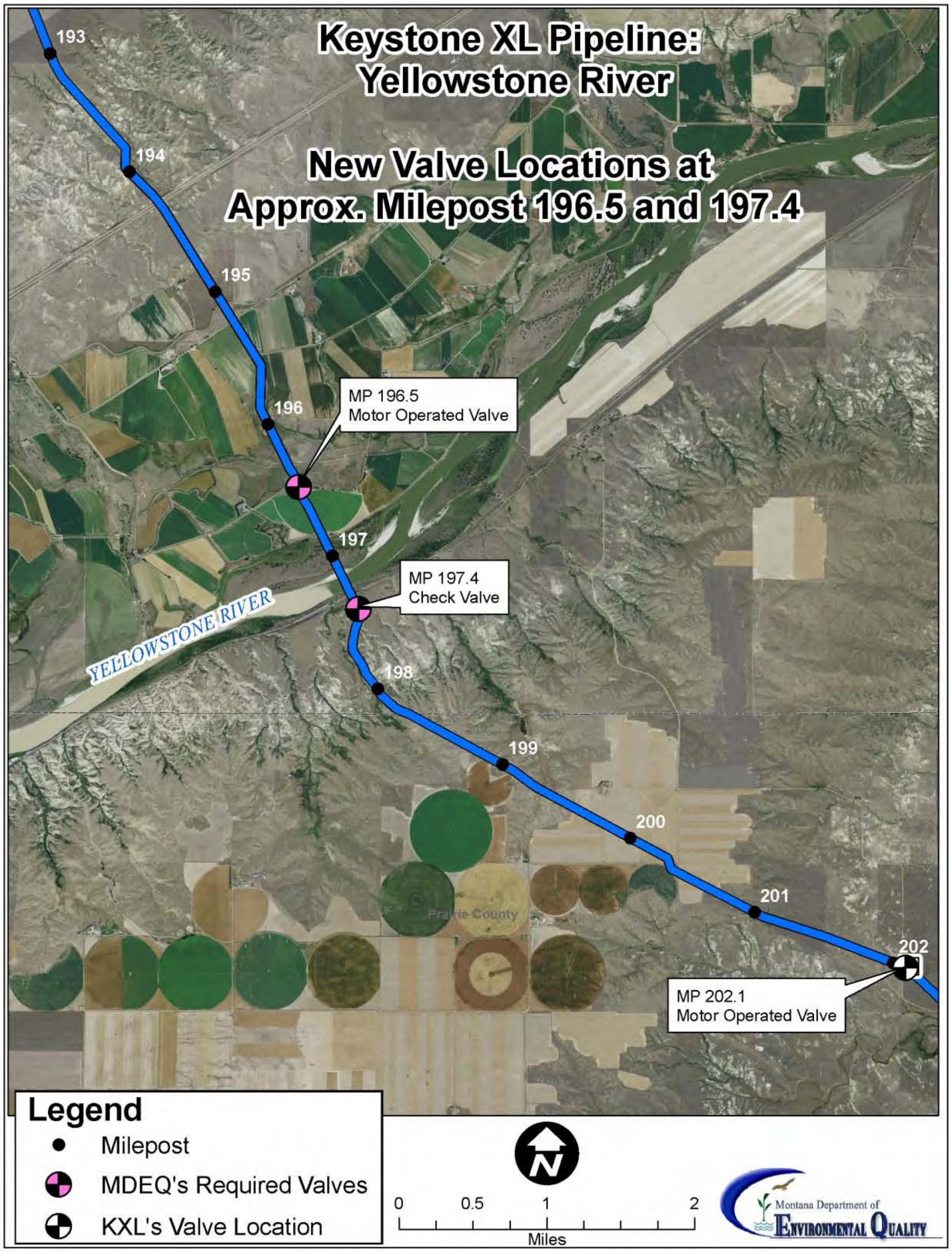
Will construction dewatering be necessary? Unlikely.

Will hydrostatic test water be diverted from this stream or river? The source and diversion rate have not yet determined. Keystone will have to apply for and obtain a water use permit from the Department of Natural Resources and Conservation. Recognize that the Department of Fish, Wildlife, and Parks holds a sizeable instream flow reservation that may restrict the time and rate at which water is diverted from the Yellowstone River.

Are there any site specific issues or mitigating measures? Main line equipment is to drive around this crossing on existing roads. All drilling mud and cuttings are to be disposed of in a manner such that they will not reach or be transported by runoff to state waters.

Are rookeries present within 500 M of the crossing? None were observed.


DAWSON COUNTY
TO BE DETERMINED
PRELIMINARY
TransCanada
YELLOWSTONE RIVER HDD INSTALLATION
KEYSTONE XL PROJECT
DAWSON & PRAIRIE COUNTY, MONTANA
Scale: 1" = 200'
Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 40'
REFERENCE DRAWINGS
REVISION
APPROVAL


Keystone XL Pipeline:
Yellowstone River
New Valve Locations at
Approx. Milepost 196.5 and 197.4
193
194
195
196
197
198
199
200
201
202
MP 196.5
Motor Operated Valve
MP 197.4
Check Valve
MP 202.1
Motor Operated Valve
YELLOWSTONE RIVER
Legend
Milepost
MDEQ's Required Valves
KXL's Valve Location
0
0.5
1
2
Miles
Montana Department of
Environmental Quality

Date: Oct. 22, 2010
Stream Name: Dry Fork Creek
Approximate Milepost: 227.1
FWP fisheries value class: 6. Note that at this location Dry Fork Creek is located in a relatively wide wetland.

Are special status fish or amphibians present? No records were found in FWP's MFISH database and no special status species were observed during the inspection.

If so, timing of spawning and rearing? NA.

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? Burial depth would be six feet below the minimum thalweg elevation (the low point in the stream channel cross section).

What is the width of deep burial to avoid pipeline exposure from stream meander? The deep pipeline burial should be extended across the wetland for about 170 feet.

How will streambanks be stabilized following construction? Bank hardening with riprap is not allowed. During initial reclamation, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized? Yes, by moving the centerline about 50 feet east to avoid the buffalo berry shrubs and by reducing the ROW to 85 feet per page 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves needed? No.

Is equipment cleaning required before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW.

Will construction dewatering be necessary? Possibly.

Will hydrostatic test water be diverted from this stream or river? Not applicable.

Site specific issues/mitigations? Move the centerline about 50 feet east to avoid the buffalo berry shrubs. Main line equipment to cross the wetland on a matted crossing.

Rookeries present within 500M? None were observed.

Date: Oct. 22, 2010
Stream Name: Unnamed tributary of Pennel Creek
Approximate Milepost: 236
FWP fisheries value class: Not rated, flowing water was not present at the time of the inspection.

Are special status fish or amphibians present? No special status species were observed during the inspection.

If so, timing of spawning and rearing? NA.

Are special timing restrictions needed? Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations? Burial depth would be six feet below the minimum thalweg elevation (the low point in the stream channel cross section).

What is the width of deep burial to avoid pipeline exposure from stream meander? The six foot burial depth would be maintained for approximately 25 feet, with the understanding that the deep burial may extend further to the northwest to facilitate crossing of the pipelines located there.

How will streambanks be stabilized following construction? Bank hardening with riprap is not allowed. During initial reclamation, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized? Yes, by reducing the ROW to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Should the right of way width be reduced at the approaches to the stream crossing? Yes, reduce to 85 feet per p. 48 of the November 2008 Construction, Mitigation, and Reclamation Plan.

Are additional valves needed? No.

Is equipment cleaning required before and after work in stream due to presence of exotic species? Equipment is to be cleaned and dried prior to moving to the ROW. Canada thistle is present so equipment needs to be cleaned before moving off this site.

Will construction dewatering be necessary? Possibly.

Will hydrostatic test water be diverted from this stream or river? Not applicable.

Site specific issues/mitigations?  Main line equipment is to cross the creek on a temporary bridge that would span the creek.

Are rookeries present within 500 M of the crossing?  None were observed.

Date:  Oct. 22, 2010
Stream Name:  Little Beaver Creek
Approximate Milepost:  263
FWP fisheries value class:  5

Are special status fish or amphibians present?  No special status species were noted during this inspection but frogs and turtles were observed earlier in 2010.

If so, timing of spawning and rearing?  Spring and summer.

Are special timing restrictions needed?  Other than to construct the crossing outside the spring runoff period, no additional timing restrictions are proposed beyond those listed in the Environmental Specifications.

What is the depth of burial based on stream channel scour calculations?  Burial depth would be eight feet below the minimum thalweg elevation (the low point in the stream channel cross section).

What is the width of deep burial to avoid pipeline exposure from stream meander?  Increased burial depth would be extended for approximately 180 feet across the modern floodplain, from the base of the steep bank northwest of the stream crossing to the base of the second terrace southeast of the crossing.

How will streambanks be stabilized following construction?  Bank hardening with riprap is not allowed.  During reclamation, erosion control blankets are to be installed on the stream banks, and the stream banks are to be reseeded and revegetated.

Should clearing of riparian or wetland vegetation be minimized?  Yes, to the extent practicable given the length of the deep burial.

Should the right of way width be reduced at the approaches to the stream crossing?  Yes, to the extent practicable given the length of the deep burial.

Are additional valves needed?  No.

Is equipment cleaning before or after work in stream due to presence of exotic species?  Equipment is to be cleaned and dried prior to moving to the ROW.

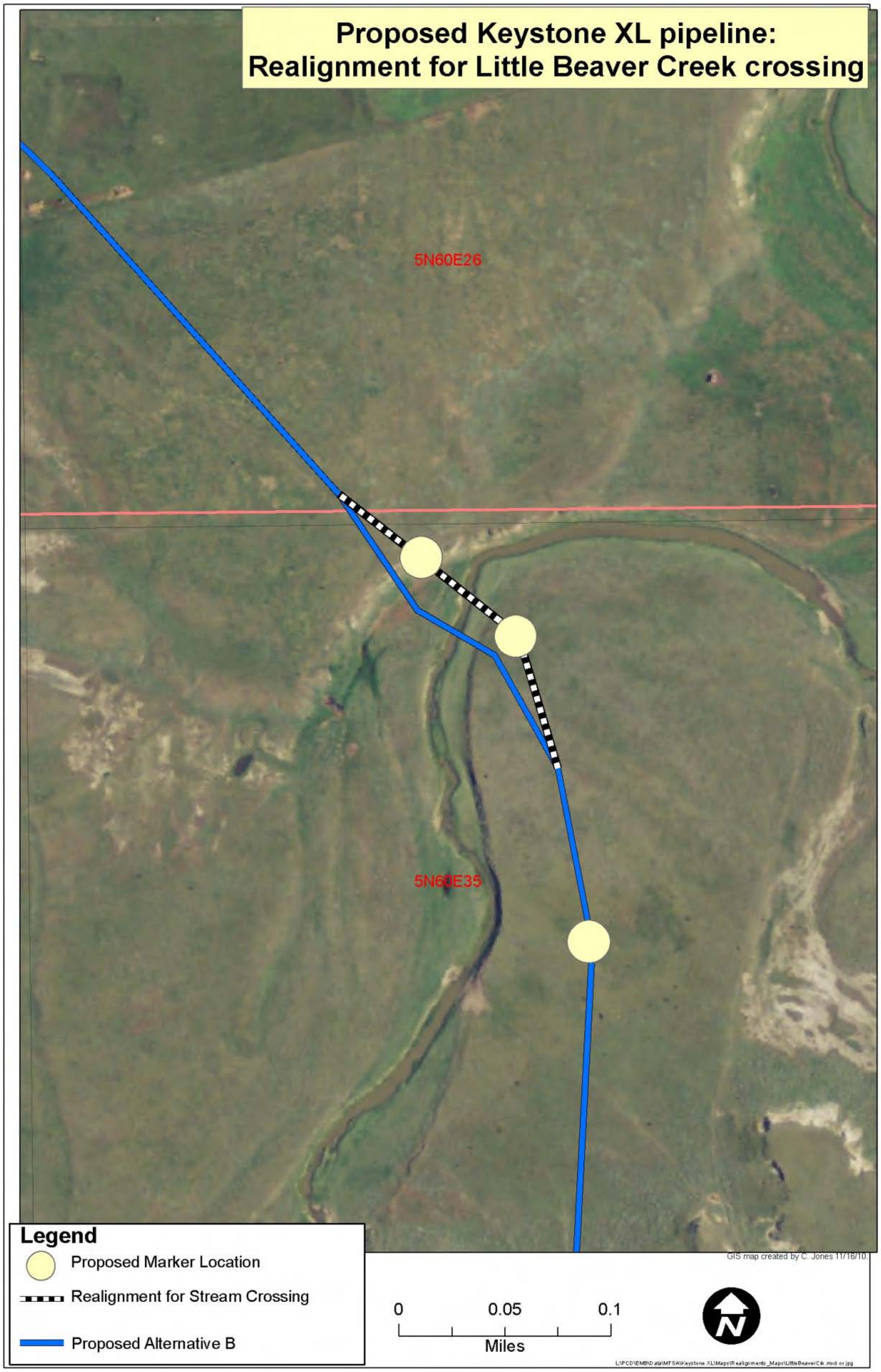
Will construction dewatering be necessary?  Probably.

Will hydrostatic test water be diverted from this stream or river?  Not applicable.

Site specific issues/mitigations?  Main line equipment is to cross the creek on a temporary bridge that would span the creek.  The centerline was moved about 100 feet downstream during the inspection to avoid the deepest part of a pool, making a dam and pump or dam and flume or dam and pump crossing more feasible.  However, given the width of deep burial, a horizontal directional drill also would be an acceptable method of crossing.

Aerial markers are to be added at the points shown on the attached figure.

Are rookeries present within 500M of the crossing?  None were observed.



Proposed Keystone XL pipeline:
Realignment for Little Beaver Creek crossing
5N60E26
5N60E35
Legend
Proposed Marker Location
Realignment for Stream Crossing
Proposed Alternative B
0
0.05
0.1
Miles
GIS map created by C. Jones 11/16/10

In addition to the burial depths described above, Keystone has conducted additional field investigations to determine design burial depths on other streams. If the Project is approved and alignments selected that affect these streams, many would be reviewed in the field during 2011 or 2012 before construction would begin at these streams. Table L-1 briefly describes the proposed burial depth at the crossings and the width that this deeper burial depth would be extended.

Table L-1: Additional Stream Crossing Burial Depths

| Approximate Milepost | Stream Name | Depth of Burial Below the Thalweg (feet) | Width of Deep Burial (feet) |
|---|---|---|---|
| 2.58 | Lost Creek (MTV-6) | 6 | 170 |
| 6.24 | Lost Creek (MTV-6) | 6 | 65 |
| 55.5 | Buggy Creek | 6 | 95 |
| 67.2 | Cherry Creek | 67.2 | 45 |
| 70.4 | Spring Coulee | 5 | 40 |
| 153.7 | Buffalo Springs Creek | 6 | 55 |
| 234.7 | Pennel Creek | 6 | 25 |
| 244.6 | Sandstone Creek | 8 | 20 |
| 276.4 | North Fork Coal Bank Coulee | 6 | 75 |
| 279.5 | South Fork Coal Bank Coulee | 8 | 65 |
| 281.5 | Boxelder Creek | 6 | 115 |

# Appendix M: Hazardous Materials Management Plan

(To be approved by DEQ prior to beginning of operations.)

Releases and spills should be reported immediately to the state's Disaster and Emergency Services (DES) 24-hour phone number (406) 841-3911 and the STATE INSPECTOR. If no one can be reached at that number, the release or spill may be reported to the Montana Department of Environmental Quality (DEQ) duty officer at (406) 431-0014. In addition to the following reporting requirements, notification(s) may be required by permits issued by state, federal, or local government agencies. Notification to the National Response Center (NRC) may also be required. NRC can be reached at 800-424-8802. DES and DEQ are not responsible for making this notification.

The following types of spills must be reported to DES/DEQ:

- Releases or spills of hazardous substances in amounts that meet or exceed the reportable quantities in 40 CFR Part 302. Notification to DES and NRC is required.
- Spills, overfills, and suspected releases from underground storage tanks and petroleum storage tanks. ARM 17.56.501, *et seq*.
- Releases or spills of any materials that would lower the quality of groundwater below water quality standards. ARM 17.30.1045.
- Spills of twenty-five (25) gallons or more of any petroleum product such as: gasoline, diesel fuel, aviation fuel, asphalt, road oil, kerosene, fuel oil; produced water, injection water, or combination thereof; and derivatives of mineral, animal, or vegetable oils.

The following types of spills should be reported to DES/DEQ:

- Spills that enter or may enter state water or a drainage that leads directly to surface water;
- Spills that cause sludge or emulsion beneath the surface of the water, stream banks, or shorelines;
- Spills that cause a film, "sheen", or change the color of the water, stream banks, or shorelines; or
- Spills of 25 gallons or more of crude oil.

# Appendix N: Fire Prevention and Suppression Plan

TABLE OF CONTENTS

## 1.0 INTRODUCTION

This plan identifies measures to be taken during pipeline construction, operation, and maintenance to ensure that fire prevention and suppression techniques are carried out in accordance with federal, state, and applicable local regulations. The fire control authority contact names identified in Table N-1 will be update prior to the start of construction.

## 2.0 PURPOSE

The risk of fire danger during pipeline construction is related to operating vehicles and other equipment off roadways; burning slash material and other open burning; welding activities; and the use of explosive materials and flammable liquids. This plan establishes standards and practices which will minimize the risk of fire danger and, in case of fire, provide for immediate suppression.

## 3.0 RESPONSIBILITIES AND COORDINATION

The Fire Prevention and Suppression Plan will be implemented by the OWNER. The OWNER will be responsible for providing all necessary fire-fighting equipment on the Project site to its employees, and operating under the requirements of the plan. In addition, the OWNER will contact the following authorities prior to construction to establish communication, obtain permits (if applicable), and/or fulfill other obligations as directed by the fire control authorities:

**TABLE N-1**
**Fire Control Authorities**

| County | Authority | Fire Management Officer/ Contact | Phone Number |
|---|---|---|---|
| **Phillips** | BLM - Malta | Mitch Maycox | (406) 538-1986 |
| | County | | |
| **Valley** | BLM - Miles City | Scott McAvoy | (406) 233-2875 |
| | County | | |
| **McCone** | BLM - Miles City | Scott McAvoy | (406) 233-2875 |
| | County | | |
| **Prairie** | BLM - Miles City | Scott McAvoy | (406) 233-2875 |
| | County | | |
| **Fallon** | BLM - Miles City | Scott McAvoy | (406) 233-2875 |
| | County | | |

In the event of an uncontrolled fire, the OWNER will immediately notify local fire control agencies by phoning 911 if pipeline personnel do not extinguish it quickly.

In the event that open-cut trenches cross a road, the OWNER will provide a schedule of road closures to all local fire control agencies. Typically, roads will be closed for at least six hours during the open-cut construction procedure. A by-pass will be constructed prior to open-cut installation of a road crossing, unless a convenient detour can be established on existing roads. By-passes will be constructed within the approved right-of-way or additional temporary work space.

## 4.0 PERFORMANCE REQUIREMENTS

The Fire Prevention and Suppression Measures Plan is only in effect from June 1 to October 31 each year. The STATE INSPECTOR or county fire authorities may change the dates of this period by advance written notice, if justified by unusual weather or other conditions. However, required tools and equipment will be kept in serviceable condition and be immediately available for fire suppression at all times.

## 5.0 PERMITS

The OWNER will notify the STATE INSPECTOR prior to conducting any burning. Burning will be conducted in accordance with the requirements and restrictions of the STATE INSPECTOR and air quality permits. In addition, no burning will be conducted on federal lands without prior written authorization from the BLM Fire Management Officer.

## 6.0 FIRE PREVENTION

The following discussion addresses methods and procedures which will be implemented prior to and during the construction period to minimize the risk of fire. Key areas of concern relate to equipment, personnel, and construction procedures.

In order to reduce fire hazard, small trees and brush cut during construction should be chipped, burned, and/or scattered. Slash 3 inches in diameter or greater may be scattered in quantities of up to 1.5 tons/acre unless otherwise requested by the LANDOWNER. Tops, limbs, and brush less than 3 inches in diameter and 3 feet in length may be left in quantities less than 3 tons/acre except on cropland and residential land or where otherwise specified by the LANDOWNER. In certain cases, the STATE INSPECTOR will authorize chipping and scattering of tops, limbs, and brush in excess of 3 tons/acre as an erosion control measure. Merchantable timber should be decked and removed at the direction of the LANDOWNER or managing agency.

### 6.1 Equipment

During construction, operation, maintenance, and termination of the right-of-way, all equipment with an internal combustion engine will be equipped with spark arresters. However, spark arresters are not required on trucks, buses, and passenger vehicles (excluding motorcycles) which are equipped with an unaltered muffler. In addition, each motorized unit will be equipped with a minimum of one fire extinguisher having an

Underwriter Laboratories (UL) rating of at least 5 B or C, one long handled shovel size "0" or larger, and one double bit axe or pulaski (three pounds or larger).

The OWNER will provide basic fire-fighting equipment at all times, including fire extinguishers, shovels, axes, and other tools in sufficient number so that each employee can assist in the event of a fire-fighting operation. One backpack pump, long handled shovel size "0" or larger, and double-bit axe or pulaski (three pounds or larger) will be required in the vicinity of welding sites. A water truck will also be available for use. All equipment will be kept in a serviceable condition and readily available.

6.2 Personnel

The OWNER will designate one person as a Fire Guard for each construction spread who is physically able, vigilant, and suitably trained to detect fires and use required fire-fighting equipment. The Fire Guard may perform other functions during pipeline construction in addition to his/her fire guard responsibilities. The Fire Guard will be identified by a decal on his/her hardhat and/or other appropriate designation. The Fire Guard will be responsible for establishing and maintaining contact with fire control agencies. He/she will be equipped with a radio or cellular telephone so immediate contact with local fire control agencies can be made. An alternate or back-up Fire Guard will be designated to assume responsibility if the primary guard becomes unable to perform his/her duties.

The OWNER will inform each construction crew member of fire dangers, locations of extinguishers and equipment, and individual responsibilities for fire prevention and suppression during regular safety briefings. All support and employee vehicles will be parked and stored in cleared, open areas within the approved work limits. No additional areas will be cleared for parking. Personnel will not be allowed to start or maintain open fires for cooking or warming.

6.3 Construction Procedures

The OWNER will restrict operations during conditions of extreme fire danger, as directed by the STATE INSPECTOR, local land management agencies or local fire control agencies. All welding activities will be curtailed during "red flag" conditions (or high burning index) as requested by federal, state, or local agencies. When red flag conditions are forecast, the Fire Guard will contact local fire control agencies and/or the BLM Fire Management Officer for a determination as to when welding activity must cease. During a red flag condition, the OWNER must obtain approval from fire control agencies or the BLM Fire Management Officer to proceed with construction if acceptable precautions are implemented.

7.0 FIRE SUPPRESSION

All available resources will be employed to ensure that uncontrolled range, forest, or structure fires are suppressed immediately with minimum property damage.

In the event of an uncontrollable fire, the local fire control agency, STATE INSPECTOR, LANDOWNER, tenant, or land management agency will be contacted immediately. The OWNER will maintain an up-to-date list of land owners/managers and agency contacts along each segment of the pipeline right-of-way.

## 8.0 MONITORING

The OWNER's ENVIRONMENTAL INSPECTORS and STATE INSPECTORS will inspect the job site and the OWNER's operations for compliance with all provisions of the Fire Prevention and Suppression Plan. In addition, federal, state, and local fire control agencies have the right to perform inspections in areas under their jurisdiction.

Appendix O:  Burning Plan and Fire Plan

(To be approved prior to beginning of operations per conditions of the CERTIFICATE.)

Appendix P: Watersheds and Other Areas
Where the use of Herbicides are Prohibited

The DEQ has identified no areas where the use of herbicides is prohibited. Herbicides shall be applied in accordance with label instructions and County Weed Control plans.

Appendix Q: Construction Inspections of
Designated Access Routes on Public Roads

Pre-Construction Phase

The OWNER shall identify county roads and state highways that will be used as designated ACCESS ROUTES to transport equipment, supplies and materials, and personnel to and from the Project. Maps showing the ACCESS ROUTES, as well as other information described in pre-construction inspection items 1 through 8 below, will be provided to the STATE INSPECTOR and MDT at least 60 days prior to the start of construction in each construction spread. This information will also be provided to counties crossed by designated ACCESS ROUTES for a given construction spread at least 60 days prior to the start of construction in that spread.

A pre-construction inspection of all designated ACCESS ROUTES on public roads shall be completed by a licensed engineer to document pre-construction condition of the roads. The licensed engineer conducting the pre-construction inspection shall be selected as follows:

1. DEQ and MDT shall prepare a list of no fewer than four (4) licensed engineers acceptable to the agencies. The OWNER may provide a list of licensed engineers for agency consideration.
2. DEQ shall provide the agency list to the OWNER.
3. The OWNER shall provide DEQ and MDT with a list of at least 50 percent of the licensed engineers from the agency list.
4. DEQ and MDT shall select the licensed engineer from the short list provided by the OWNER.

The pre-construction inspection of designated ACCESS ROUTES on public roads will include:

1. Video documentation of the pre-Project condition of all designated ACCESS ROUTES on public roads.
2. Road profiling of asphalt surfaces to determine the degree of pre-construction wear. Road profiling will be completed as specified by MDT in consultation with the OWNER.
3. Documentation of pre-Project grading schedule for gravel roads by counties. Identification of segments of county road maintained for oil field access.
4. For all bridges on designated ACCESS ROUTES on public roads: documentation of weight limits, visual inspection to verify the pre-Project condition, and identification of the bridge rating if the bridge is determined to be deficient or obsolete.
5. Documentation of location, condition, and size of culverts; location and condition of cattle guards; and location and condition of any fords that would be crossed. Identification of any upgrades needed for Project access.

6. Identification of segments on county roads with short sight distance that could pose a safety hazard during construction. These segments would be manned with flaggers or signed in accordance with the Manual on Uniform Traffic Control Devices during periods of heavy construction use.
7. Identification of alternative ACCESS ROUTE(S), if designated ACCESS ROUTE(S) become unusable during construction.

Results of the pre-construction inspection will be provided to the OWNER, STATE INSPECTOR, MDT, and to counties at least 60 days prior to the start of construction for review and comment.

Construction Phase

Travel on designated ACCESS ROUTES on public roads shall be conducted so as to prevent damage to existing infrastructure, and all weight limits shall be followed. If such infrastructure is damaged by vehicular travel, the OWNER shall immediately inform the STATE INSPECTOR, MDT, and the applicable county, and immediately make temporary repairs to minimize further damage and assure continued public access and safe passage. The OWNER shall make permanent repairs at the first available opportunity to a reasonably satisfactory condition in consultation with MDT or the applicable county. See also Environmental Specification 2.3.4.

Prior to and during the use of unpaved ACCESS ROUTES for construction access, the OWNER shall apply a dust palliative to such roads that are within 0.1 mile of a residence or road intersection and other areas identified by the county where dust may pose a traffic hazard to vehicles using the roads.

The OWNER shall designate a Keystone XL Project Liaison for communication regarding Project ACCESS ROUTES and provide contact information to the STATE INSPECTOR, MDT, and counties.

Post-Construction Phase

A post-construction inspection of all ACCESS ROUTES on public roads used during Project construction shall be completed by the licensed engineer selected for pre-construction inspections. If another engineer is selected, DEQ, MDT, and the OWNER shall use the selection process specified for the pre-construction phase. The post-construction inspection shall identify damage and wear-and-tear to transportation infrastructure above that considered typical for roads used to access the Project. The inspection will be completed by a licensed engineer using the methods described above and as specified by DEQ and MDT.

Results of the post-construction inspection shall be provided to the OWNER, STATE INSPECTOR, MDT, and counties for review. Any damage or wear-and-tear to transportation infrastructure on these Project ACCESS ROUTES resulting from Project construction beyond that considered typical, as determined by consensus of MDT, the applicable county, and the OWNER, shall be repaired to the satisfaction of the owner of the easement or right-of-way. If consensus cannot be reached, the amount of damage or wear-and-tear to transportation infrastructure resulting from Project construction beyond that considered typical shall be determined by MDT for state roads and by the applicable county for county roads.

*Methodology for bridge inspections: MDT Bridge Inspection Manual*
*See also MDT descriptions of alligator cracks and longitudinal cracks.*
*Signing – see Manual on Uniform Traffic Control Devices*

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# ATTACHMENT 2

## Montana Department of Environmental Quality

## Requirements of the Short-term Narrative Water Quality Standard for Turbidity (318 Authoriztion) Related to Construction Activity in State Waters Pursuant to 75-5-318, Montana Code Annotated

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VALID (date) through (date).

Dear (applicant name):

The Montana Department of Environmental Quality (DEQ) Water Protection Bureau has completed our review of your project for activity on water bodies that would be crossed by the pipeline alignment shown on Figure I-2.6-1 of Appendix I in the draft Environmental Impact Statement. This activity herewith is qualified for a temporary surface water quality turbidity standard if it is carried out in accordance with the following conditions:

Project General Conditions:

(1) Construction activities in or near the watercourse are to be limited to the minimum area necessary, and conducted so as to minimize increases in suspended solids and turbidity which may degrade water quality and damage aquatic life outside the immediate area of operation,

(2) The use of machinery in the watercourse shall be avoided unless absolutely necessary. To prevent leaks of petroleum products into waterways, no defective equipment shall be operated in the watercourse or adjacent areas capable of contributing surface flow to the watercourse,

(3) Precautions shall be taken to prevent spillage of any petroleum products, chemicals or other deleterious material in or near the watercourse, and no equipment shall be fueled or serviced in adjacent areas capable of contributing surface flow to the watercourse,

(4) All disturbed areas on the streambank and adjacent areas created by the construction activity shall be protected with temporary erosion control during construction activities. These areas shall be reclaimed with appropriate erosion control measures and revegetated to provide long-term erosion control,

(5) Any excess material generated from this project must be disposed of above the ordinary high water mark, not classified as a wetland, and in a position not to cause pollution to State waters,

(6) Clearing of vegetation will be limited to that which is absolutely necessary for construction of the project,

(7) The use of asphalt or petroleum-based products as riprap is strictly prohibited. Its use as fill material is also prohibited if it is placed in a location where it is likely to cause pollution of State waters,

(8) This authorization does not authorize a point source surface water discharge. A MPDES permit is required for said discharge,

(9) Precautions shall be taken to prevent spillage of any petroleum products, chemicals or other deleterious material in or near the watercourse, and no equipment shall be fueled or serviced in adjacent areas capable of contributing surface flow to the watercourse. A spill containment kit must be available at the work site.

Project Specific Conditions:

(1) For each component of the facility crossing a stream (pipeline, valve, pump station, road crossing, and associated power line), a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

a. the completion of all required surveys and reports;
b. the start of construction; and
c. the start and completion of initial reclamation and revegetation.

Keystone will notify DEQ any changes in this schedule.

(2) Flow in a stream course may not be permanently diverted. If temporary diversion is necessary, flow must be restored before a major runoff season or the next spawning season, as determined by the state inspector(s) in consultation with the managing agencies.

(3) Any snow removal shall be done in a manner to preserve and protect road signs and culverts, to ensure safe and efficient transportation, and to prevent excessive erosion to roads, streams, and adjacent land.

(4) The owner of the facility (Owner) shall comply with the erosion control measures described in the Storm Water Pollution Prevention Plan filed with DEQ.

(5) The open-cut, wet method of constructing stream crossings is not allowed if water is present at the time of construction.

(6) At least 60 days prior to the start of construction at a perennial stream crossing or at the crossing of a stream containing a fish species of special concern, the Owner shall submit a site-specific stream crossing plan. At least 30 days prior to constructing the facility or associated facilities at a perennial stream crossing or stream containing a fish species of special concern, the state inspector shall conduct an on-site inspection of the crossing. The Owner shall provide access to the stream crossing. The state inspector shall invite the Owner, a representative of Montana Fish, Wildlife, and Parks, representatives of the local conservation district(s), and the landowner or land management agency to attend this inspection. The purpose of the inspection shall be to determine the final location of the crossing, the crossing method, width and depth of burial to be used and site-specific reclamation measures. The results of these inspections shall be included in Appendix L of the Environmental Specifications required as part of the approval of a Certificate of Compliance for this project. Restrictions on the timing of construction activities at stream crossings will be specified following onsite inspections.

(7) Access roads shall cross drainage bottoms at sharp or nearly right angles and level with the streambed whenever possible. Use of temporary bridges, fords, culverts, or other structures to avoid stream bank damage is required when water is present at the crossing of streams. A one-time crossing of the stream to install temporary crossings may be allowed if no access is readily available. No stream crossings will be allowed without proper water quality permits and written authorization from DEQ.

(8) Streambed materials shall not be removed for use in backfill, embankments, road surfacing, or for other construction purposes except where removed from the trench at a stream crossing.

(9) Trench breakers will be installed where necessary to control the flow of ground water along the trench.

(10) Blasting may be allowed in or near streams if precautions are taken to protect the stream from debris and entry of nitrates or other contaminants into the stream, after applicable permits and authorizations are obtained. The Owner shall obtain the written approval of the state inspector prior to conducting any blasting near streams.

(11) Culverts, arch bridges, or other stream crossing structures shall be installed at all permanent crossings of flowing or dry watercourses where fill is likely to wash out during the life of an access road. On access road(s) all temporary culverts shall be sized to pass 2-year flood requirements and shall be removed after reclamation. The state inspector may approve exceptions. Permanent culverts shall be sized to pass the 100-year flood requirements. Culvert size shall be determined by standard procedures which take into account the variations in vegetation and climatic zones in Montana, the amount of fill, and the drainage area above the crossing. All culverts shall be installed at the time of access road construction.

(12) No perennial watercourses shall be permanently blocked or diverted.

(13) If trench dewatering is necessary, water will be discharged to the ground where adequate vegetative cover exists to prevent channeling and sediment transport, or into temporary dewatering structures constructed of silt fence and/or straw bales. No discharges to surface waters are allowed without a valid discharge permit from DEQ.

(14) Earth next to the pipeline or access road(s) that cross streams shall be replaced at slopes less than the normal angle of repose for the soil type involved.

(15) No construction shall begin at each crossing of perennial streams and streams containing fish species of special concern until site-specific detailed Construction Drawings of stream crossings are submitted to DEQ and approved by DEQ prior to the start of construction.

(16) At stream crossings the Owner shall calculate the depth of scour based on a 100-year flood event and the size of sediments and geologic materials found at the crossing. The Owner shall bury the pipeline below this calculated depth to ensure that floods and lateral channel movement do not expose the pipeline over its lifetime. The scour depth calculation method shall be approved in advance by DEQ. The burial depth shall be extended laterally as approved by DEQ after field inspection of the crossing site.

Although not a condition of this authorization, if possible, please send a digital photo or two of the pre or post project site conditions to jeryan@mt.gov.

This authorization is only valid for the period noted above. No authorization is valid for more than a one-year period of time.

Any violations of the conditions of this authorization may be subject to an enforcement action pursuant to the applicable provisions of the Montana Water Quality Act. This authorization is granted pursuant to 75-5-318, MCA, and only applies to the activity described by your application. Any modification of the activity described in your application which may result in additional turbidity in the stream must receive prior approval from the Department. You may contact me at (406) 444-4626.

Sincerely,

Jeff Ryan

Water Quality Specialist

Water Protection Bureau

e-mail jeryan@mt.gov

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# ATTACHMENT 3

## Draft Keystone XL Pipeline Rate Impact Study and Responses to Public Comments

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# DRAFT

# Keystone XL Pipeline Rate Impact Study


## By

## Larry Nordell

## Montana Consumer Counsel


The Keystone XL pipeline is proposed to be built to carry synthetic crude oil (syncrude), produced from the heavy bitumen mined at the tar sands project in Alberta, to markets in the US Gulf Coast. The pipeline would run from Hardesty, Alberta, to Texas. The line would run about 282 miles through Montana, entering the state from Alberta at a point approximately 39 miles NNW of Saco, and crossing into South Dakota at a point roughly 27 miles east of Ekalaka. The pipeline is designed to carry about 830,000 barrels[1] a day of crude oil, requiring electrically driven pump stations spaced periodically along the route. Six pump stations are proposed to be located in Montana. Service to these pump stations would be provided by local utilities – five by rural electric cooperatives and one by Montana Dakota Utilities (MDU).

Construction of the Keystone XL pipeline requires review and permitting under the Montana Major Facilities Siting Act (MFSA), administered by the Montana Department of Environmental Quality. Montana law[2] also requires that any facility covered by MFSA be the subject of a study of the rate impacts to Montana electric consumers, to be performed by the Montana Consumer Counsel. This report describes the results of that study.

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[1] The original design called for pumping volumes of 900,000 barrels per day. The pipeline sponsors notified the Montana DEQ on October 10, 2010, that this has been reduced to 830,000 barrels a day. It is not known whether the reduction in design capacity will affect pump station design or load but in any case a reduction in pump load will not result in increased risk of rate impacts.

[2] ***69-2-216. Customer fiscal impact analysis – requirements.*** *(1) Within 10 days of receiving an application pursuant to subsection (1)(a) or (1)(b), the department of environmental quality shall notify the office of consumer counsel that it is in receipt of:*

*(a) a permit application pursuant to Title 75, chapter 2, 5, or 10, for a new electrical generation facility; or*

*(b) an application for a certificate under the Montana Major Facility Siting Act for a new facility or upgrade, as defined in 75-20-104.*

*(2) The office of consumer counsel shall complete an analysis outlining the fiscal impacts of the project on electricity customers in Montana. The analysis must include an estimation of how customers' rates may be impacted.*

*(3) (a) Except as provided in subsection (3)(b), the analysis must be completed within 30 days of receipt of the notice from the department.*

*(b) The department shall extend the 30-day deadline if compliance with the deadline is not necessary to comply with the requirements of subsection (4).*

*(4) The analysis must be provided to the department and incorporated into the department's environmental review, including draft documents released for public comment.*

*(5) (a) Within 5 days of the close of the public comment period for an application referred to in subsection (1)(a) or (1)(b), the department shall forward public comments related to the analysis to the consumer counsel.*

*(b) The consumer counsel shall respond to the comments and return the responses to the department within 30 days, and the responses must be included in the final environmental reviews.*

The pipeline would serve no Montana customers other than possibly opening a new route for Montana oil producers to ship product to Gulf Coast markets. Since it would not sell electricity, there would be no direct impact on electricity consumers due to the construction and operation of the pipeline. However, service to the pump stations involves varying amounts of investment in new transmission lines and substations by the Montana electrical utilities providing service, and the electrical consumption of the pump stations may be a significant increase in the volume of electricity needed to be acquired and sold by them.

**Table 1. Pump Station Locations, Electric Provider, and Transmission and Substation Construction Requirements[3]**

| Pump Station | Name | Provider | Transmission (miles) | Voltage | Transmission, substation cost |
|---|---|---|---|---|---|
| PS9 | Phillips | Big Flat EC | 62 | 115 kV | $20.6 million |
| PS10 | Valley | NorVal EC | 50 | 115 kV | $17.3 million |
| PS11 | Fort Peck | NorVal EC | 0 | 230 kV | $4.5 million |
| PS12 | Circle | McCone EC | 5 | 115 kV | $4.9 million |
| PS13 | Prairie | Tongue River EC | 15 | 115 Kv | $7.6 million |
| PS14 | Fallon | MDU | 5 | 115 kV | $4.9 million |

It should be noted that Montana law exempts from the rate impact study requirement electrical transmission lines proposed by utilities that report to the Montana Public Service Commission or to FERC. If the electrical facilities required by the pipeline were simply freestanding projects to be built by the relevant utilities, no rate impact study would be required for them. Further, some or all of the transmission projects needed to serve the pump stations may be exempt from the requirements of MFSA either because of the length and voltage of the projects or because they come under a "75/75" exemption. However they are being studied here as possible sources of indirect impacts of Keystone, because they are solely or primarily intended to support the Keystone Pipeline and any impacts would be attributable to the construction of the pipeline.

The potential for impacts to the electrical customers of the utilities depends upon the costs to the utilities of providing service and the rates and other cost sharing and guarantee arrangements they negotiate with the pipeline. If the rates for service cover at least the incremental costs of service and the pipeline operates as planned, there should be no near term direct impact on rates. However, if the service is provided at current average cost of service rates while the incremental cost of power is greater than the current average cost, electric customers could see their rates go up as a result of service to the pipeline.

Further, the utilities will have to construct new facilities that will be dedicated to service to the pipeline, for example transmission lines to serve a remote pump station, or a substation to

[3] Source for pump station data in Tables 1-2: letter Brian Holland to Larry Nordell, Sept 15, 2010

provide voltage transformation and switching capability. If the utilities finance the costs of these facilities and expect to recover the costs over time through a capital component embedded in monthly rates per kWh or per kW, the utility and its customers could be at risk should the pipeline not be completed, shut down prematurely, or significantly scale back its shipments. While such eventualities may seem unlikely at present, energy markets are volatile and change in unpredictable ways, and future environmental regulations that might affect the tar sands project are impossible to predict[4]. Complete insulation of existing electrical customers from such risks would probably require specific financial arrangements such as up-front financing by the pipeline or posting of long-term bonds to guarantee repayment; even then some residual risk, such the risk of default by a bonding agency, might remain.

With regard to information sources used in preparing this report, the legislation that placed responsibility for this analysis on the Montana Consumer Counsel did not provide the MCC with the ability to require parties to answer questions or to provide data. Therefore this report is primarily based upon information voluntarily provided by Keystone, the three G&T coops (Central Montana G&T serves Big Flat and NorVal, Upper Missouri G&T supplies McCone, and Southern Montana G&T supplies Tongue River) that provide wholesale supply to the four coops to serve pump station loads, WAPA, MDU, and from the coops themselves. Some limited published data, for example from the Rural Utilities Service, the EIA, and from the Montana Electric Cooperatives' Association, was also of use.

This impact study focuses on the potential risk to ratepayers, and the actions that might protect them from rate impacts. Three potential sources of risk are addressed: the acquisition and resale of power to serve the pump stations; the financial commitment required to construct transmission and substation facilities to connect the pump stations to the grid; and the long term costs of adding new electric generating facilities to serve load growth. The study evaluates the situation of each of the suppliers, and their efforts to protect themselves and their ratepayers.

## 1. Power supply risk

Coop customers could be at risk if the costs of serving the pump stations exceed the average costs currently faced by the coops to supply their customers and the suppliers average all costs to set rates. The coops have the benefits of an allocation of relatively low cost power from Federal Missouri River hydro projects that meets part of their needs; averaging costs to set rates to the pump stations could result in diluting those benefits for existing customers. The magnitude of the pipeline load is significant, and if the full incremental costs are not recovered from the pipeline, customers could see their rates go up noticeably. On the other hand, if rates are properly designed to pass through the incremental power costs and to pick up a share of the coop overhead, existing customers could benefit from the presence of the pump station load. The coops are not regulated, and have the flexibility to set their own rates. On the other hand, MDU does not have that flexibility as it must serve customers under rates posted with and approved by

[4] Pump station power usage in Montana could also be reduced if large quantities of crude were to be shipped from points south of Montana to the Gulf Coast, reducing or displacing flows from Alberta.

the Montana Public Service Commission. Any modification of those existing, posted tariffs would require approval by the PSC.

**Table 2. Pump size, Electrical Load, Electrical Use (all pumps 6500 hp)**

| Pump Station | Pumps | Peak Load | Average Load | Annual Energy[5] |
|---|---|---|---|---|
| PS9 | 2 | 9.6 MW | 6.7 MW | 58.7 million kWh |
| PS10 | 3 | 13.6 MW | 9.5 MW | 83.2 million kWh |
| PS11 | 3 | 13.6 MW | 9.5 MW | 83.2 million kWh |
| PS12 | 3 | 13.6 MW | 9.5 MW | 83.2 million kWh |
| PS13 | 3 | 13.6 MW | 9.5 MW | 83.2 million kWh |
| PS14 | 3 | 13.6 MW | 9.5 MW | 83.2 million kWh |

**Table 3. Pump station load vs current supplier load**

| Pump Station | Provider | PS Load (million kWh/yr | Provider MT Load[6] | % Increase |
|---|---|---|---|---|
| PS9 | Big Flat EC | 58.7 million | 27.1 million | 217% |
| PS10,11 | NorVal EC | 166.4 million | 54.9 million | 303% |
| PS12 | McCone EC | 83.2 million | 64.9 million | 128% |
| PS13 | Tongue River EC | 83.2 million | 86.4 million | 96% |
| PS14 | MDU | 83.2 million | 700.4 million | 12% |

### a. Big Flat and NorVal Electric Cooperatives

Two of the coops, Big Flat EC and NorVal EC, serving three pump stations, are supplied by the Central Montana Electric Power Cooperative (Central Montana). The pump stations will be very significant loads for the coops. For Big Flat EC, electric consumption by pump station 9 is more than twice the current total usage of all existing customers. Table 4 below indicates the current load of Big Flat is approximately 27 million kWh/year, while PS 9 is expected to use about 59 million kWh/year[7].

NorVal EC is about twice the size of Big Flat EC, with current sales at approximately 55 million kWh per year. The two pump stations that will be served by NorVal are larger than PS 9; PS 10 and PS 11 will each use about 83.2 million kWh per year, for a total load on NorVal of 166.4 million kWh. This is about three hundred percent of current sales.

[5] Assumes pipeline runs 8760 hours per year; should be adjusted for down time as there are no spare pumps
[6] Source: EIA.
[7] Note that the projected load at PS9 is 9.6 MW, while the load at each of the other pump stations in Montana is 13.6 MW. The pump stations and electric facilities to serve them are designed for an ultimate possible buildout to 22.7 MW, however the analysis below focuses on the initial construction levels because it was not know when or whether the ultimate buildout would take place. The conclusions remain basically the same.

Central Montana gets its supply mainly from three sources: the Western Area Power Administration (WAPA), the Basin Electric Power Cooperative (Basin), and an allocation from BPA which will expire in September, 2011. WAPA provides a fixed allocation of power from the upper Missouri Basin Pick-Sloan program dams operated by the US Bureau of Reclamation. This is preference power allocated to coops, municipalities and public agencies. It is relatively low cost power because it comes from older projects built by the Federal government and it is sold at cost, although the costs include a share of the costs of power delivered to irrigation projects. No new projects are planned, so the Pick-Sloan allocation will increasingly be supplemented as loads served by Central Montana grow.

Basin Electric Power Cooperative owns thermal plants and some renewable plants. Basin is in the position of being the marginal supplier that serves load growth for its customers, and builds new generation as needed.

Central Montana has adopted a policy of melding its Pick Sloan and BPA allocations with power from Basin Electric to serve the residential and farm loads of the coops it serves. However, all large loads of 3 MW or higher are separately metered and billed, and are served solely with power from Basin Electric. For current customers of Big Flat and NorVal, this means that the benefits they receive of Pick-Sloan power (BPA power will not be available after September 2011) will not be adversely affected by service to the Keystone XL pump stations, because those pump stations will pay a rate that includes the full cost of power from Basin Electric charged to Central Montana (which will include a share of Central Montana's overhead costs) billed to the coops, and passed through to Keystone with a share of the coops' overhead costs. There should be no direct impact to existing customer rates for Big Flat and NorVal due to supplying power to the pump stations[8].

**b. McCone Electric Cooperative**

McCone EC is about 20 percent larger than NorVal, with current sales of about 65 million kWh per year. Pump station 12, to be served by McCone, is the same size as PS 10 and PS 11, and will use about 83.2 million kWh per year, roughly 130 percent of current sales.

McCone EC is supplied by the Upper Missouri Generation and Transmission Electric Cooperative and the Central Montana Electric Power Cooperative. However, Central Montana serves only one delivery point for McCone, at Mosby, so power for PS 12 will come from Upper Missouri. Like Central Montana, Upper Missouri has a fixed allocation of Pick-Sloan power from WAPA, and the remainder of its needs is provided by Basin Electric[9].

Upper Missouri does not socialize the Pick-Sloan allocations of its members; each retains the allocation it was originally given and the WAPA power is passed through to the coops at cost. Similarly, power from Basin Electric is passed through to the coops at cost, although the rates may be specific to particular end users. Upper Missouri's overheads are not billed at a kWh rate but are charged directly to the coops. Power for PS 12 will be metered directly by Upper

[8] Personal communications from Doug Hardy, Central Montana; Jeanne Bernard, Big Flat EC; Craig Herbert, NorVal E.C., and Dave Raatz, Basin Electric Power Cooperative.
[9] Personal communications, Mike Kays, McCone E.C., and Dave Raatz, Basin Electric.

Missouri, supplied to Upper Missouri by Basin at Basin's large pumping rate, and passed through to McCone at the same rate. McCone will pass that rate through to Keystone with appropriate overheads added. McCone's customers should see no dilution of the benefit they receive from Pick-Sloan power, and there should be no direct impact on their rates due to McCone's service to PS 12.

### c. Tongue River Electric Cooperative

Tongue River EC is the largest of the four eastern Montana electric cooperatives serving the pipeline. Tongue River EC has current sales of approximately 87 million kWh per year. Pump station 13, to be served by Tongue River, is the same size as PS 10, 11 and 12, and would use about 83.2 million kWh per year, which is about 96 percent of current loads.

Tongue River EC is supplied by the Southern Montana Electric Generation and Transmission Cooperative. Southern Montana receives a fixed allocation of preference power from the Pick-Sloan projects through WAPA. Southern Montana also has a small allocation of Federal preference power from the Bonneville Power Administration that expires next year. Southern Montana does not belong to Basin Electric Power Cooperative; rather it buys power to serve the needs of its members (beyond the fixed preference power allocation) from the market, including PPL Energy Plus. Southern Montana will purchase power to serve Pump Station 13 from a market participant in the Eastern Interconnection of the national electric grid.[10] The costs of this purchase, plus the associated transmission costs to deliver the power to PS 13, (plus a share of Southern Montana overhead costs) will be directly billed to Tongue River and passed through to Keystone[11]. As with the loads served by Central Montana, this ensures that Keystone pays at least the incremental costs of service and that Southern Montana retains the full benefits of the Pick-Sloan preference power for its members' existing residential and farm load.

### d. Montana Dakota Utilities

Finally, MDU would provide service to PS 14. MDU is much larger than the coops, with current sales in Montana of about 700 million kWh per year. The pump station load is only about 12 percent of current sales. Consequently, an underrecovery would have a much smaller impact on existing customers.

MDU is in a somewhat different position than the coops, since it will be selling power to Keystone XL pipeline at a tariffed rate, the Large General Electric Service Rate 30, filed with the Montana Public Service Commission[12]. Following is a summary of the current rate, filed October 1, 2009:

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[10] The high voltage AC transmission network of the US and Canada consists of five separate grids, (the Western Interconnection, the Eastern Interconnection, Texas, Alaska, and Quebec) which are not synchronized with each other and which can only be connected for purposes of transferring power with expensive AC-DC-AC converter stations. The boundary between the Eastern and Western Interconnections passes through eastern Montana, where there is a converter station at Miles City. PS 13 is located on the eastern side of the system break and its power supply must come from the Eastern Interconnection.

[11] Personal communications, Alan See, Tongue River E.C., and Tim Gregori, Southern MontanaE.G.&T.

[12] Personal communication, Tammy Aberle, MDU.

| | | |
|---|---|---|
| Base Rate: | $25.00 per month | |
| Primary Service: | | |
| Demand Charge: | October-May | $5.15 per KW |
| | June-September | $6.15 per KW |
| Energy Charge | | |
| | October-May | 3.565¢ per KWh |
| | June-September | 5.445¢ per KWh |

These rates are subject to periodic change as MDU files new rates and the Montana PSC approves them. At the current rates, Keystone XL would pay approximately $4.4 million per year for electric power (not counting recovery of transmission and substation investments discussed below). This is equivalent to an average rate of approximately 5.3¢ per kWh[13]. The rate can be expected to go up as MDU's costs go up in the future.

MDU indicates that this is adequate to cover the incremental cost of service to the pump station, although the Public Service Commission rate setting process focuses on just and reasonable rates based on actual and measurable costs, and is intended to cover actual average costs, not incremental costs. There is no basis for estimating a near term rate impact to MDU's existing customers on the basis of this charge (however see further discussion below on MDU's recovery of transmission and substation investments).

## 2. Transmission and substation investment risk

The second type of risk that could be imposed upon existing electric customers is associated with the need to construct varying amounts of new transmission lines and new substations to serve the pump stations. Table 2 summarizes the investment needed to serve each of the pump stations in Montana. The wide variation is due to the location of each substation in relation to the nearest location it can be reasonably served from on the existing transmission grid. Table 4 summarizes the new investment required for each of the electrical suppliers. For comparison purposes the current plant in service for each supplier is shown. As can be seen from Table 4, the required investment is significant, and would be a very large investment for Big Flat and NorVal, given the current size of the coops. To serve Pump Station 9, Big Flat must build 62 miles of new 115 kV line, plus a substation facility, at an estimated cost of $20.6 million. By comparison, the value of Big Flat Electric Coop's current plant in service is approximately $18 million. The new facilities will cost 114 percent of Big Flat's total current investment in plant. Similarly, PS10 will require a significant investment by NorVal. (PS11, also to be served by NorVal, is located adjacent to a point on the grid where it can be served from and will require only substation equipment – transformation and switching.) PS10 will require the construction of 50 miles of new 115 kV transmission line, plus substation equipment, at a cost of $17.3 million. Total investment required for NorVal for the two pump stations it will serve is estimated at $21.8 million. By comparison, the current plant in service for NorVal is $29.2 million. Service to the two pump stations requires an investment of about 75 percent of NorVal's total current plant.

[13] MCC calculation, assumes monthly usage of 6.933 million kWh; annual usage 83.2 million kWh; monthly demand of 13.6 MW.

The other suppliers do not face as big a burden relative to their current size. To serve PS 12, McCone Electric Coop will have to build 5 miles of new transmission, plus substation facilities, at a cost of $4.9 million, about 17 percent of its current plant of $28.7 million. To serve PS13, Tongue River EC will have to build 15 miles of new transmission, plus substation facilities, at a cost of $7.6 million, about a quarter the size of its current plant of $29.6 million. To serve PS14, MDU will have to build 5 miles of new transmission, plus substation facilities, at a cost of $4.9 million (Keystone estimate; MDU estimates $3.3 million[14]), under 3 percent of its current Montana plant in service total of $189 million.

Customers could be at significant risk with these investments, particularly customers of Big Flat and Norval, but also those of McCone and Tongue River, and to a much lesser degree, MDU, if the utilities invest in the facilities and for some reason are unable to recover their costs from Keystone. For example, if cost recovery is based on a long amortization period and insufficient guarantees or security is not in place, the supplier and its existing customers could be at risk if the project is never completed, or if the project is completed but shuts down prematurely, or if recovery is predicated on the expected volume of power use and the pipeline does not run at projected levels.

The suppliers recognize this risk and are taking a variety of approaches to protect themselves and their customers.

**Table 4. New Facility Investment Requirements vs. Current Supplier Plant in Service**

| Pump Station | Provider | New Facility Investment Need | Provider Plant in Service[15] | % Increase |
|---|---|---|---|---|
| | | | | |
| PS9 | Big Flat EC | $20.6 | $18.0 | 114% |
| PS10, 11 | NorVal EC | $21.8[16] | $29.2 | 75% |
| PS12 | McCone EC | $4.9 | $28.7 | 17% |
| PS13 | Tongue River EC | $7.6 | $29.6 | 26% |
| PS14 | MDU | $4.9 | $189.0 | 3% |

### a. Big Flat

Big Flat EC's transmission project includes shared facilities, that will be used to serve some of Big Flat's customers as well as the pump station, for the first 33 miles, for which costs will be shared proportional to demand; the remainder of the line will be a dedicated facility billed entirely to Keystone, through a facility charge with provisions to prevent stranding. As part of the shared facility, Big Flat will also build a substation to serve existing customers who are

[14] MDU provided a construction cost estimate of $3.3 million for facilities to serve PS14 in 2008. This number should be adjusted for inflation to the date of construction, which is not known. Keystone has estimated the cost of the electrical supply facilities needed for PS14 at $4.9 million, but the date of the estimate is not known.
[15] Source: USDA Rural Utilities Service, 2008 Statistical Report, Rural Electric Borrowers
[16] Total for pump stations 10 and 11.

currently served by an obsolete substation far from their load, which will be retired. Shared facilities will be prorated by load according to the maximum possible ultimate buildout of the pump station (22 MW) and the area load (4 MW). Preconstruction expenses are being paid up front by Keystone under a letter agreement. Once a construction contract is signed by Keystone, Big Flat will finance the project through National Rural Utilities Cooperative Finance Corporation. Costs will be recovered and the loan repaid through monthly capital expense charges to Keystone. Provisions in both construction and operating contracts provide for guarantees from TransCanada, the corporate parent of Keystone XL, to ensure Big Flat will recover all stranded costs due to non-completion or premature shutdown. A separate monthly capital expense charge should eliminate any risk associated with reduction of throughput[17].

**b. NorVal**

Like Big Flat, NorVal intends to finance the investments in transmission and substation facilities required to serve PS10 and PS11 through CoBank of Colorado, and to recover the costs through monthly charges that cover the loan repayments. Security arrangements with TransCanada will ensure the loan is repaid without risk to other NorVal members, in the form of a Letter of Credit, with a provision for a balloon payment in the event of a premature shutdown of the pipeline[18].

**c. McCone**

McCone EC has arranged to have Keystone provide quarterly contributions of construction funds as the required transmission and substation facilities are built. In this way McCone will have no funds of its own or its members invested in the facilities to serve PS 12, and will bear no risk from them.

McCone also notes that WAPA will have pump station related investment costs of $3.14 million, which will be prorated and charged to the pipeline owners if service is discontinued within 17 years[19].

**d. Tongue River**

Tongue River will finance the transmission and substation investments required to serve PS 13 by borrowing from either the Cooperative Finance Corporation or CoBank. They will bill Keystone with a flat monthly capital recovery charge sufficient to pay off the loan over a term yet to be determined in the range of 8 to 15 years. Keystone will also provide an irrevocable letter of credit or letter of guarantee, from a bank with a credit rating acceptable to the coop's bankers, to ensure against any risk from premature shut down of the pipeline before the loan is paid off[20].

**e. MDU**

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[17] Jeanne Bernard, op.cit.
[18] Craig Herbert, op.cit.
[19] Mike Kays, op.cit
[20] Alan See, op.cit.

MDU is bound by its line extension policy (Extension Policy Rate 112), approved by the Public Service Commission, which states that "a permanent extension may be constructed without a contribution if the estimated project construction cost is equal to or less than two times the estimated annual revenue." Projected power use by pump station 14 meets this test. MDU states that the rate for power sales to Keystone (see discussion above) includes a fixed cost margin that for a new load provides a margin which, if the test is met, is sufficient to recover the investment required to serve the load. MDU has used this methodology successfully with extensions to serve new large loads previously and is satisfied that it ensures there is no impact to other customers.

MDU will require TransCanada to carry a letter of credit for 5 years, rated at the full amount of MDU's transmission and substation investment cost for the first three years, with a reduction by one-third for each of the remaining two years if load projections are met[21].

### 3. <u>Long Term Power Cost Impact Risk</u>

The above discussion focuses on the near term risk to existing utility customers due to the provision of service by specific Montana electric suppliers to the Keystone XL pipeline pump stations. Over the long run, as loads grow, all power suppliers with a responsibility to serve customers eventually need to add new sources of supply to satisfy the growing loads. These new sources of supply can be new generating plants or they can be market purchases. Because inflation seems to be intrinsic to the US and world economies, it is often thought that new generating plants typically cost more than older plants, and adding new plants to a utility portfolio tends to drive up the cost of power. This would imply that load growth will tend to result in increased costs, and it has been suggested that addition of a new large block load, like the pumping load of the Keystone XL pipeline, will have a similar effect. This is a generalization, of course. If prices for the fuel to run an older plant go up sufficiently, construction of a new plant using a cheaper fuel may result in costs going down. Generating plants that burned diesel were retired after the petroleum crises of the 1970s and replaced with coal or natural gas fueled plants. In recent years most new thermal generating plants have been gas-fired, although now there is a significant push for environmental reasons to rely more on renewable generation. In the northern Great Plains, wind generation is the renewable technology of choice.

The common assumption among energy observers that new power plants are generally more expensive than old ones, is consistent with industry experience from the 1960s through the 1990s, when most new plants were nuclear or coal plants, but it has not always been the case and it may or may not be true in the future. From the earliest days of the utility industry until the 1960s, rates declined significantly as engineering improvements and higher pressures, together with increasing generating plant size, continually increased the efficiency and reduced the heat rate of coal plants, and as technology change reduced the cost of mining coal. During this period each new generation of power plant was larger, more efficient, and cheaper than the last. After about 1960 these improvements ceased to dominate the industry, and large, expensive coal plants and nuclear plants drove up power costs with each new plant. However, since the late 1980s

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[21] Tammy Aberle, op.cit.

new generation has mostly relied on natural gas, with increasing use of wind, and while power plant costs remain subject to cost inflation, they may not automatically drive up rates. Current industry expectations are that natural gas will remain in relatively plentiful supply, while wind costs, particularly the costs of regulating wind, are uncertain but potentially subject to a learning curve. Environmental costs and regulation may drive up the costs of power from existing coal plants. These factors could lead to an environment where new plant costs could reduce average costs.

An increase in load growth does advance the date at which new plants are needed, and the Keystone pump station loads, like all growth, will likely have that effect. While pricing arrangements like those used by the coops can protect against dilution of the benefits they receive from the Pick Sloan project, they cannot protect against an increase in the costs of Basin Electric Coop's portfolio if Basin has to add new plants that drive up power costs. MDU customers are in a similar position. Basin and MDU will do the best they can, within the relevant framework of environmental and RPS regulations, to ensure they pick the best resources as they expand.

On the other hand, if there is an offsetting decline in loads, either through the loss of existing large industrial loads or simply due to unfavorable economic conditions, planned new generating plants may be put on the shelf and plants with expensive operating costs may not run as often. On balance, it may not be possible to discern in advance whether, how much, and possibly even in what direction load growth will affect rates.

**a. <u>MDU</u>**

MDU's last resource plan, completed and filed with the Montana PSC in 2009, was predicated on a resource plan that included the projected load of PS14[22]. That forecast showed projected summer peak loads of about 531 MW in 2012, including 13.6 MW for PS14. Taking out that load would reduce forecasts by 13.6 MW, to something over 517 MW in 2012, 529 MW in 2013, and 542.5 MW in 2014. Thus addition of the pipeline load advances projected load growth by a little over one year. The resource plan indicates a need to add resources to meet loads and reserve requirements. The chosen resource plan called for additional capacity purchases for the period 2011 through 2014, adding around 130 MW of baseload power from a share in the planned Big Stone II plant by 2015, a 75 MW natural gas fired combustion turbine in 2015, and a second 75 MW combustion turbine in 2021. It also called for an additional 15 MW of demand side resources and interruptible load by 2015, and a wind farm, the Cedar Hills project, 19.5 MW to come on line in 2010. (The Big Stone II plant was abandoned in November 2009, and MDU indicated it would issue an RFP for capacity and energy purchases to begin in 2015.[23] These dates are likely to be subject to change as the target dates approach, due to the uncertainty over future load growth and resource availability and the normal practice in turning resource plans into decisions to begin construction. Further, MDU's need for new resources is significantly affected by its reserve requirement. Historically, the reserve requirement has been 15 percent, and this is a major driver in MDU's resource planning. The Midwest Independent System

[22] Montana-Dakota Utilities Co. 2009 Integrated Resource Plan, submitted to the Montana Public Service Commission September 15, 2009. Docket N2009.9.122
[23] MDU response to PSC-001 in MPSC docket N2009.9.122.

Operator (MISO) is currently considering a change in reserve requirements that could have the effect of reducing MDU's need for reserves; this would defer the need for new resources to come on line. It is possible that the presence or absence of the Keystone load could change the dates that new resources would be added, although given the size of contracts that are expiring in 2014, as well as the uncertainty over load growth and possible loss of existing loads, it is unlikely that there would be any significant advancing of the date at which new resources come on line.

When and if PS14 is expanded to its ultimate level of 22.7 MW (an increase of 9.1 MW) a similar analysis would show the possible advancing of construction of planned resources by up to a year.

### b. Basin Electric

Basin Electric will provide the power needed to serve pump stations 9, 10, 11 and 12 in Montana. Power to serve PS13 will be provided through a market purchase by Southern Montana G&T from an unknown source, and PS14 will be provided by MDU. The cumulative power requirements faced by Basin to serve the four Montana substations would be about 50 MW, and at ultimate buildout, up to 84-91 MW. However, this is not the end of Basin's responsibility for service to the Keystone XL pipeline, and there are seven pump stations in South Dakota that will be served by coops that are Basin member systems. If all these are also served with power from Basin, then Basin's initial responsibility could be as high as 145 MW, and at ultimate buildout, as high as 243-250 MW.

Basin is a large system that serves member systems in Montana, North Dakota, South Dakota, Wyoming, Colorado and Nebraska. Basin has existing fossil generation plants with capacity totaling 3,048 MW, and existing renewable generation with total nameplate capacity of 501 MW. It has committed plants under construction or permitted totaling 940 MW, including the Dry Fork Station coal plant rated at 422 MW gross, or 365 MW net (about to be completed); the Deer Creek Station gas-fired combined cycle plant rated at 300 MW (net), scheduled to come on line in 2011; the Prairie Winds SD1 project, a 151 MW wind farm recently passed environmental permitting review by the Rural Utilities Service and WAPA, currently in the financing stage; the South Dakota Wind Partners project, an additional 15 MW wind project that would connect with and share facilities with the SD1 project[24].

The initial loads of the Keystone pump stations served by Basin could be as high as 4.8 percent of its thermal generation capability or 4.1 percent of total generation. The presence of the pump stations could lead Basin to move up by one year the targeted online date of planned new resources; an expansion to the full buildout of the pump stations at some future date could have a similar effect. However, because of the uncertainty in load growth as well as the uncertainty in the construction time and completion date of large generating resources it may not be possible to distinguish any change in the need for and on line dates of new resources.

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[24] Information from Basin Electric web site
http://www.basinelectric.com/About_Us/Corporate/At_a_Glance/index.html , and from Dave Raatz, op.cit.

## Conclusions

Service to the Keystone pump stations represents a significant increase in load, as well as a significant investment compared with current plant in service, for each of the four Montana electric coops that will serve them. However, the coops, and their suppliers, are well aware of that fact and have taken careful measures to insulate themselves and their customers from the risk of cost increases due to taking on such sizeable loads. By setting up pass-through rates for wholesale power from Basin Electric, and by security measures to ensure payment of the costs of new transmission and substation investments (and in the case of McCone, by arranging for up front payment of electric facility construction costs by Keystone) the coops appear to have done a good job of eliminating the risk of cost increases due to service to the pipeline, construction of the electrical infrastructure, or from early termination of pipeline and pump station operation.

Service to the Keystone Pump Station 14 by MDU does not represent as significant an increase in proportion to existing load as it does for the coops, rather in the order of 12 percent of Montana loads, and the required facility investment is roughly 3 percent of Montana plant in service. Nevertheless, MDU has proceeded in a way that it believes will protect its existing customers from any direct rate impacts from service to the pipeline. It will recover its infrastructure costs through the fixed cost margin on power sales, and will require an irrevocable letter of credit to ensure the revenue flow continues at least long enough to fully recover those costs. Should any unexpected risks emerge, the Montana PSC will have tools at its disposal to protect MDU's other customers, for example by directing MDU to create a separate rate class to recover costs directly from the pipeline. While it has never been done in Montana, in the event of a shutdown the PSC may be able to require a write-off of any incomplete cost recovery of special purpose facilities built to serve the pipeline.

There could be some long term impacts to the resource portfolio plans of Basin Electric and of MDU, in the form of a need to advance the dates at which new resources are planned to come on line. However, given the size of the pump station loads served relative to the resource portfolios and planned new resources of Basin and MDU, and given the normal uncertainties over load growth and the cost and completion dates of planned facilities, any such impacts should be minor and in fact may not be distinguishable.

# Keystone XL Pipeline Rate Impact Study

## Responses to Public Comments

## by the

## Montana Consumer Counsel

This document is provided in accordance with sections 69-2-216 and 217 of the Montana Code Annotated, which require the Montana Consumer Counsel to conduct an analysis of the fiscal impacts on electricity customers of a project applying for a certificate under the Major Facility Siting Act. It further requires DEQ to publish the report and allow for public comments, and requires the Consumer Counsel to respond to these comments. This document contains MCC's response to public comments on the rate impact analysis, in accordance with section of 69-2-216 5 (b), MCA.

1. Commenter: Northern Plains Resource Council
   Commenter: David Barnick
   Commenter: Sandy Barnick
   Comment: please provide agreements between Keystone and the utilities under which Keystone will pick up all costs.

   Response: This request should be addressed to the utilities; MCC does not have the agreements. Due to the utilities' confidentiality concerns, information on the contract arrangements was provided in oral communication and is included in the report.

2. Commenter: Northern Plains Resource Council
   Commenter: David Barnick
   Commenter: Sandy Barnick
   Comment: Please provide a list of the actions MDU is taking to protect themselves and their customers from rate increases as a result of the pipeline.

   Response: MDU indicates it holds an irrevocable letter of credit to ensure costs will be recovered in the event of a premature shutdown or abandonment of the pipeline. Further, see the Public Service Commission comment below.

3. Commenter: Montana Public Service Commission
Comment: The Montana Public Service Commission offers the following comments regarding the Montana Consumer Counsel's Rate Impact Study of the Keystone XL Pipeline as it pertains to the regulated electric service provided by Montana Dakota Utilities (MDU) to supply Pump Station 14.
The Commission concurs with the findings of the Montana Consumer Counsel that MDU has plans in place to ensure costs related to the project will be borne by the electric services' requester, the TransCanada Corporation (TransCanada). The Commission is accordingly satisfied that fixed costs will be recovered pursuant to MDU's line-extension policy, which has been approved previously by the Commission. Additionally, MDU holds an irrevocable letter of credit from TransCanada to recover infrastructure costs in the eventuality of the pipeline's premature discontinuation or abandonment. In this way, the Commission expects that existing customers will be protected from any direct rate impacts relating to services to the pumping station which MDU will serve.

Response: We appreciate the comment.

4. Commenter: Alan Kent and Christie Liles
Comment: The draft rate impact study notes that, under Montana law, electrical transmission lines proposed by utilities that report to the Montana Public Service Commission or to FERC are exempt from the rate impact study requirement. Is this because TransCanada Keystone Pipeline,LP. was designated a Regulated Common Carrier on August 16th 2010?

Response: No. This reference in the rate impact study explains why a rate impact study is being done despite the exemption for transmission lines proposed by utilities reporting to the PSC (MDU) or to FERC (the coops).

5. Commenter: Alan Kent and Christie Liles
Comment: I as a landowner have been wondering how we can comment on the common carrier issue that became a significant role player in the Keystone XL Pipeline Project after the public comment period ended in July, 2010. Does it make no difference if there is never an on-ramp constructed; or is their a projected timeframe or schedule for the on-ramp facility? I as a landowner question that because they hold out to be a common carrier; with the understanding of offering a possibly on-ramp with the proper application process; then we as landowners impacted just have to accept this concept? Since they have been given designation as a common carrier because of the on-ramp; what happens if the on-ramp is never constructed in Montana? If this happens what is our recourse of action as landowners who would have been condemned by TransCanada Keystone Pipeline,LP.?

Response:  These questions are beyond the scope of the rate impact study.

6. Commenter: Alan  Kent and Christie Liles
   Comment: This paragraph also has a statement that states “Further, some or all of the transmission projects needed to serve the pump stations maybe exempt from the requirements of MFSA either because of the length and voltage of the projects or because they come under a “75/75” exemption.” Could you please explain this statement (especially the “75/75” exemption)?

   Response:  Title 75, Part 20, MCA, the Montana Major Facility Siting Act, requires a certificate of Environmental Compatibility for transmission lines as follows:

   > 75-20-104(8) "Facility" means:
   > (a) each electric transmission line and associated facilities of a design capacity of more than 69 kilovolts, except that the term:
   > (i) does not include an electric transmission line and associated facilities of a design capacity of 230 kilovolts or less and 10 miles or less in length;
   > (ii) does not include an electric transmission line with a design capacity of more than 69 kilovolts but less than 230 kilovolts for which the person planning to construct the line has obtained right-of-way agreements or options for a right-of-way from more than 75% of the owners who collectively own more than 75% of the property along the centerline;
   > ….

   For transmission lines serving the pump stations that are greater than 10 miles in length , DEQ has been advised  that the cooperatives will be seeking exemption from review under MFSA as provided for in 75-20-104(8)(ii).  If the cooperatives are unable to obtain the requisite easements or options for these lines longer than10 miles, they would have to apply for a certificate of compliance under MFSA.  Transmission lines shorter than 10 miles in length that would serve pump stations are being considered as “associated facilities,” because they are “devices of equipment associated with the delivery of the energy from a facility” as part of the Keystone XL pipeline application.

   The effect of the 75/75 rule is to encourage finding routes that satisfy landowner concerns, but to ensure that most landowners along a route, as well as the owners of the land traversed by most of the line, are in agreement.  This presumably would prevent a favorable deal with a few large landowners (for example, the BLM) that ignores the rest, and it would also preclude negotiating only with the smallest landowners and ignoring the large ones.

According to DEQ, negotiations are still underway and are not expected to be concluded until after the Final EIS is released.

7. Commenter: David Barnick
   Commenter: Sandy Barnick
   Comment: For McCone Electric Cooperative, there also needs to be an assurance that the added expenses for power is paid by Trans Canada for their use. The members should not be expected to pay for the power for the pipeline to run for their own profit.

   Response: As discussed in the report, all of the coops have recognized this risk and dealt with it by delivering power directly from the wholesale supplier. McCone will supply pump station 12 with power delivered by Upper Missouri G&T from the Basin Electric Power Cooperative, at Basin's large pumping rate. McCone's members should be insulated by this arrangement from any added expenses for power associated with service to Keystone. If any additional assurances are deemed to be required they would have to be negotiated between McCone Electric Cooperative and TransCanada.

8. Commenter: Irene Moffet
   Comment: The rate impact analysis should address the generation needed to supply the pumping stations, not only in Montana, but also those in South Dakota that will be served by Basin. What will Basin Electric need to do to provide power to serve the pump stations in Montana? How will building a new plant affect the costs of power charged to the coops? Will all members be charged if rates go up?

   Response: This was addressed in section 3b of the paper.

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# APPENDIX O

## Socioeconomics

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# INDEX OF TABLES

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| **United States** | **308,745,538** | **38,929,319** | **12.6** | **2,932,248** | **0.9** | **15,214,265** | **4.9** | **19,107,368** | **6.2** | **9,009,073** | **2.9** | **85,192,273** | **27.6** |
| **Montana** | **989,415** | **4,027** | **0.4** | **62,555** | **6.3** | **6,921** | **0.7** | **5,975** | **0.6** | **24,976** | **2.5** | **104,454** | **10.6** |
| Phillips | 4,253 | 1 | 0.0 | 351 | 8.3 | 11 | 0.3 | 17 | 0.4 | 171 | 4.0 | 551 | 13.0 |
| CT 602 | 4,253 | 1 | 0.0 | 351 | 8.3 | 11 | 0.3 | 17 | 0.4 | 171 | 4.0 | 551 | 13.0 |
| BG 4 | 1,139 | 0 | 0.0 | 88 | 7.7 | 3 | 0.3 | 11 | 1.0 | 36 | 3.2 | 138 | 12.1 |
| Valley | 7,369 | 17 | 0.2 | 724 | 9.8 | 40 | 0.5 | 24 | 0.3 | 155 | 2.1 | 960 | 13.0 |
| CT 1001 | 1,513 | 0 | 0.0 | 24 | 1.6 | 4 | 0.3 | 6 | 0.4 | 21 | 1.4 | 55 | 3.6 |
| BG 1 | 659 | 0 | 0.0 | 3 | 0.5 | 1 | 0.2 | 6 | 0.9 | 7 | 1.1 | 17 | 2.6 |
| BG 2 | 854 | 0 | 0.0 | 21 | 2.5 | 3 | 0.4 | 0 | 0.0 | 14 | 1.6 | 38 | 4.4 |
| CT 9406 | 3,063 | 10 | 0.3 | 571 | 18.6 | 27 | 0.9 | 7 | 0.2 | 58 | 1.9 | 673 | 22.0 |
| BG 1 | 808 | 7 | 0.9 | 30 | 3.7 | 9 | 1.1 | 2 | 0.2 | 15 | 1.9 | 63 | 7.8 |
| BG 2 | 1,003 | 2 | 0.2 | 499 | 49.8 | 15 | 1.5 | 2 | 0.2 | 18 | 1.8 | 536 | 53.4 |
| BG 3 | 1,252 | 1 | 0.1 | 42 | 3.4 | 3 | 0.2 | 3 | 0.2 | 25 | 2.0 | 74 | 5.9 |
| McCone | 1,734 | 4 | 0.2 | 7 | 0.4 | 2 | 0.1 | 1 | 0.1 | 21 | 1.2 | 35 | 2.0 |
| CT 9540 | 1,734 | 4 | 0.2 | 7 | 0.4 | 2 | 0.1 | 1 | 0.1 | 21 | 1.2 | 35 | 2.0 |
| BG 1 | 1,018 | 3 | 0.3 | 6 | 0.6 | 0 | 0.0 | 1 | 0.1 | 8 | 0.8 | 18 | 1.8 |
| BG 2 | 716 | 1 | 0.1 | 1 | 0.1 | 2 | 0.3 | 0 | 0.0 | 13 | 1.8 | 17 | 2.4 |
| Dawson | 8,966 | 27 | 0.3 | 156 | 1.7 | 31 | 0.3 | 27 | 0.3 | 143 | 1.6 | 384 | 4.3 |
| CT 1 | 1,456 | 0 | 0.0 | 8 | 0.5 | 1 | 0.1 | 6 | 0.4 | 7 | 0.5 | 22 | 1.5 |
| BG 1 | 744 | 0 | 0.0 | 4 | 0.5 | 0 | 0.0 | 4 | 0.5 | 5 | 0.7 | 13 | 1.7 |
| BG 2 | 712 | 0 | 0.0 | 4 | 0.6 | 1 | 0.1 | 2 | 0.3 | 2 | 0.3 | 9 | 1.3 |
| Prairie | 1,179 | 0 | 0.0 | 2 | 0.2 | 6 | 0.5 | 2 | 0.2 | 33 | 2.8 | 43 | 3.6 |
| CT 1 | 1,179 | 0 | 0.0 | 2 | 0.2 | 6 | 0.5 | 2 | 0.2 | 33 | 2.8 | 43 | 3.6 |
| BG 1 | 1,179 | 0 | 0.0 | 2 | 0.2 | 6 | 0.5 | 2 | 0.2 | 33 | 2.8 | 43 | 3.6 |

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| Fallon | 2,890 | 2 | 0.1 | 12 | 0.4 | 19 | 0.7 | 5 | 0.2 | 38 | 1.3 | 76 | 2.6 |
| CT 1 | 2,890 | 2 | 0.1 | 12 | 0.4 | 19 | 0.7 | 5 | 0.2 | 38 | 1.3 | 76 | 2.6 |
| BG 1 | 913 | 1 | 0.1 | 3 | 0.3 | 6 | 0.7 | 1 | 0.1 | 15 | 1.6 | 26 | 2.8 |
| BG 2 | 1,104 | 1 | 0.1 | 5 | 0.5 | 2 | 0.2 | 1 | 0.1 | 13 | 1.2 | 22 | 2.0 |
| BG 3 | 873 | 0 | 0.0 | 4 | 0.5 | 11 | 1.3 | 3 | 0.3 | 10 | 1.1 | 28 | 3.2 |
| Carter | 1,160 | 1 | 0.1 | 11 | 0.9 | 1 | 0.1 | 3 | 0.3 | 9 | 0.8 | 25 | 2.2 |
| CT 3 | 1,160 | 1 | 0.1 | 11 | 0.9 | 1 | 0.1 | 3 | 0.3 | 9 | 0.8 | 25 | 2.2 |
| BG 1 | 615 | 1 | 0.2 | 4 | 0.7 | 0 | 0.0 | 1 | 0.2 | 8 | 1.3 | 14 | 2.3 |
| BG 2 | 545 | 0 | 0.0 | 7 | 1.3 | 1 | 0.2 | 2 | 0.4 | 1 | 0.2 | 11 | 2.0 |
| **South Dakota** | **814,180** | **10,207** | **1.3** | **71,817** | **8.8** | **8,004** | **1.0** | **7,477** | **0.9** | **17,283** | **2.1** | **114,788** | **14.1** |
| Harding | 1,255 | 1 | 0.1 | 19 | 1.5 | 1 | 0.1 | 9 | 0.7 | 21 | 1.7 | 51 | 4.1 |
| CT 9687 | 1,255 | 1 | 0.1 | 19 | 1.5 | 1 | 0.1 | 9 | 0.7 | 21 | 1.7 | 51 | 4.1 |
| BG 1 | 1,255 | 1 | 0.1 | 19 | 1.5 | 1 | 0.1 | 9 | 0.7 | 21 | 1.7 | 51 | 4.1 |
| Butte | 10,110 | 22 | 0.2 | 189 | 1.9 | 30 | 0.3 | 82 | 0.8 | 261 | 2.6 | 584 | 5.8 |
| CT 9676 | 2,972 | 11 | 0.4 | 57 | 1.9 | 10 | 0.3 | 6 | 0.2 | 93 | 3.1 | 177 | 6.0 |
| BG 1 | 1,177 | 8 | 0.7 | 22 | 1.9 | 5 | 0.4 | 5 | 0.4 | 37 | 3.1 | 77 | 6.5 |
| Perkins | 2,982 | 2 | 0.1 | 38 | 1.3 | 4 | 0.1 | 14 | 0.5 | 34 | 1.1 | 92 | 3.1 |
| CT 9683 | 2,982 | 2 | 0.1 | 38 | 1.3 | 4 | 0.1 | 14 | 0.5 | 34 | 1.1 | 92 | 3.1 |
| BG 2 | 981 | 0 | 0.0 | 7 | 0.7 | 1 | 0.1 | 13 | 1.3 | 14 | 1.4 | 35 | 3.6 |
| Meade | 25,434 | 319 | 1.3 | 597 | 2.3 | 184 | 0.7 | 196 | 0.8 | 733 | 2.9 | 2,029 | 8.0 |
| CT 205 | 4,380 | 100 | 2.3 | 76 | 1.7 | 71 | 1.6 | 74 | 1.7 | 137 | 3.1 | 458 | 10.5 |
| BG 2 | 837 | 2 | 0.2 | 4 | 0.5 | 1 | 0.1 | 0 | 0.0 | 13 | 1.6 | 20 | 2.4 |
| BG 3 | 1,086 | 1 | 0.1 | 19 | 1.7 | 6 | 0.6 | 3 | 0.3 | 21 | 1.9 | 50 | 4.6 |

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| Ziebach | 2,801 | 6 | 0.2 | 2,097 | 74.9 | 2 | 0.1 | 3 | 0.1 | 83 | 3.0 | 2,191 | 78.2 |
| CT 9416 | 2,801 | 6 | 0.2 | 2,097 | 74.9 | 2 | 0.1 | 3 | 0.1 | 83 | 3.0 | 2,191 | 78.2 |
| BG 1 | 1,805 | 5 | 0.3 | 1,529 | 84.7 | 2 | 0.1 | 1 | 0.1 | 62 | 3.4 | 1,599 | 88.6 |
| Pennington | 100,948 | 1,050 | 1.0 | 9,748 | 9.7 | 1,132 | 1.1 | 813 | 0.8 | 3,855 | 3.8 | 16,598 | 16.4 |
| CT 116 | 6,720 | 88 | 1.3 | 278 | 4.1 | 71 | 1.1 | 34 | 0.5 | 275 | 4.1 | 746 | 11.1 |
| BG 1 | 1,123 | 9 | 0.8 | 62 | 5.5 | 4 | 0.4 | 1 | 0.1 | 44 | 3.9 | 120 | 10.7 |
| Haakon | 1,937 | 3 | 0.2 | 37 | 1.9 | 9 | 0.5 | 4 | 0.2 | 50 | 2.6 | 103 | 5.3 |
| CT 9601 | 1,937 | 3 | 0.2 | 37 | 1.9 | 9 | 0.5 | 4 | 0.2 | 50 | 2.6 | 103 | 5.3 |
| BG 2 | 978 | 1 | 0.1 | 17 | 1.7 | 3 | 0.3 | 4 | 0.4 | 21 | 2.1 | 46 | 4.7 |
| Jones | 1,006 | 1 | 0.1 | 20 | 2.0 | 4 | 0.4 | 0 | 0.0 | 19 | 1.9 | 44 | 4.4 |
| CT 916 | 1,006 | 1 | 0.1 | 20 | 2.0 | 4 | 0.4 | 0 | 0.0 | 19 | 1.9 | 44 | 4.4 |
| BG 1 | 1,006 | 1 | 0.1 | 20 | 2.0 | 4 | 0.4 | 0 | 0.0 | 19 | 1.9 | 44 | 4.4 |
| Lyman | 3,755 | 3 | 0.1 | 1,436 | 38.2 | 11 | 0.3 | 5 | 0.1 | 109 | 2.9 | 1,564 | 41.7 |
| CT 9726 | 2,275 | 2 | 0.1 | 109 | 4.8 | 7 | 0.3 | 5 | 0.2 | 53 | 2.3 | 176 | 7.7 |
| BG 1 | 915 | 0 | 0.0 | 22 | 2.4 | 0 | 0.0 | 1 | 0.1 | 18 | 2.0 | 41 | 4.5 |
| Tripp | 5,644 | 6 | 0.1 | 788 | 14.0 | 12 | 0.2 | 13 | 0.2 | 136 | 2.4 | 955 | 16.9 |
| CT 9716 | 2,261 | 0 | 0.0 | 173 | 7.7 | 4 | 0.2 | 5 | 0.2 | 36 | 1.6 | 218 | 9.6 |
| BG 1 | 1,035 | 0 | 0.0 | 33 | 3.2 | 0 | 0.0 | 0 | 0.0 | 7 | 0.7 | 40 | 3.9 |
| BG 2 | 1,226 | 0 | 0.0 | 140 | 11.4 | 4 | 0.3 | 5 | 0.4 | 29 | 2.4 | 178 | 14.5 |
| CT 9717 | 3,383 | 6 | 0.2 | 615 | 18.2 | 8 | 0.2 | 8 | 0.2 | 100 | 3.0 | 737 | 21.8 |
| BG 1 | 1,411 | 0 | 0.0 | 323 | 22.9 | 2 | 0.1 | 4 | 0.3 | 37 | 2.6 | 366 | 25.9 |
| BG 2 | 1,074 | 3 | 0.3 | 189 | 17.6 | 5 | 0.5 | 3 | 0.3 | 43 | 4.0 | 243 | 22.6 |
| BG 3 | 898 | 3 | 0.3 | 103 | 11.5 | 1 | 0.1 | 1 | 0.1 | 20 | 2.2 | 128 | 14.3 |

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| Gregory | 4,271 | 7 | 0.2 | 320 | 7.5 | 11 | 0.3 | 10 | 0.2 | 95 | 2.2 | 443 | 10.4 |
| CT 9712 | 2,190 | 3 | 0.1 | 209 | 9.5 | 0 | 0.0 | 7 | 0.3 | 47 | 2.1 | 266 | 12.1 |
| BG 2 | 1,379 | 1 | 0.1 | 61 | 4.4 | 0 | 0.0 | 2 | 0.1 | 37 | 2.7 | 101 | 7.3 |
| **Nebraska** | **1,826,341** | **82,885** | **4.5** | **18,427** | **1.0** | **33,572** | **1.8** | **79,109** | **4.3** | **39,510** | **2.2** | **253,503** | **13.9** |
| Keya Paha | 824 | 0 | 0.0 | 1 | 0.1 | 1 | 0.1 | 2 | 0.2 | 3 | 0.4 | 7 | 0.8 |
| CT 9754 | 824 | 0 | 0.0 | 1 | 0.1 | 1 | 0.1 | 2 | 0.2 | 3 | 0.4 | 7 | 0.8 |
| BG 1 | 824 | 0 | 0.0 | 1 | 0.1 | 1 | 0.1 | 2 | 0.2 | 3 | 0.4 | 7 | 0.8 |
| Boyd | 2,099 | 1 | 0.0 | 12 | 0.6 | 19 | 0.9 | 12 | 0.6 | 20 | 1.0 | 64 | 3.0 |
| CT 9758 | 2,099 | 1 | 0.0 | 12 | 0.6 | 19 | 0.9 | 12 | 0.6 | 20 | 1.0 | 64 | 3.0 |
| BG 2 | 816 | 0 | 0.0 | 5 | 0.6 | 9 | 1.1 | 7 | 0.9 | 3 | 0.4 | 24 | 2.9 |
| Holt | 10,435 | 16 | 0.2 | 29 | 0.3 | 26 | 0.2 | 182 | 1.7 | 50 | 0.5 | 303 | 2.9 |
| CT 9740 | 1,645 | 3 | 0.2 | 0 | 0.0 | 3 | 0.2 | 3 | 0.2 | 12 | 0.7 | 21 | 1.3 |
| BG 1 | 621 | 0 | 0.0 | 0 | 0.0 | 2 | 0.3 | 3 | 0.5 | 3 | 0.5 | 8 | 1.3 |
| BG 2 | 1,024 | 3 | 0.3 | 0 | 0.0 | 1 | 0.1 | 0 | 0.0 | 9 | 0.9 | 13 | 1.3 |
| CT 9741 | 2,564 | 0 | 0.0 | 4 | 0.2 | 5 | 0.2 | 7 | 0.3 | 5 | 0.2 | 21 | 0.8 |
| BG 1 | 1,154 | 0 | 0.0 | 4 | 0.4 | 4 | 0.3 | 0 | 0.0 | 2 | 0.2 | 10 | 0.9 |
| CT 9742 | 1,910 | 3 | 0.2 | 7 | 0.4 | 3 | 0.2 | 2 | 0.1 | 3 | 0.2 | 18 | 0.9 |
| BG 1 | 1,133 | 1 | 0.1 | 3 | 0.3 | 3 | 0.3 | 1 | 0.1 | 2 | 0.2 | 10 | 0.9 |
| CT 9743 | 4,316 | 10 | 0.2 | 18 | 0.4 | 15 | 0.3 | 170 | 3.9 | 30 | 0.7 | 243 | 5.6 |
| BG 1 | 826 | 1 | 0.1 | 1 | 0.1 | 4 | 0.5 | 9 | 1.1 | 6 | 0.7 | 21 | 2.5 |
| Antelope | 6,685 | 19 | 0.3 | 11 | 0.2 | 20 | 0.3 | 77 | 1.2 | 41 | 0.6 | 168 | 2.5 |
| CT 9796 | 2,146 | 9 | 0.4 | 2 | 0.1 | 11 | 0.5 | 9 | 0.4 | 7 | 0.3 | 38 | 1.8 |
| BG 1 | 643 | 4 | 0.6 | 1 | 0.2 | 0 | 0.0 | 0 | 0.0 | 1 | 0.2 | 6 | 0.9 |
| BG 2 | 582 | 3 | 0.5 | 0 | 0.0 | 11 | 1.9 | 1 | 0.2 | 1 | 0.2 | 16 | 2.7 |
| BG 3 | 921 | 2 | 0.2 | 1 | 0.1 | 0 | 0.0 | 8 | 0.9 | 5 | 0.5 | 16 | 1.7 |

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| CT 9798 | 2,781 | 6 | 0.2 | 5 | 0.2 | 3 | 0.1 | 49 | 1.8 | 20 | 0.7 | 83 | 3.0 |
| BG 3 | 1037 | 5 | 0.5 | 5 | 0.5 | 1 | 0.1 | 8 | 0.8 | 9 | 0.9 | 28 | 2.7 |
| Boone | 5,505 | 23 | 0.4 | 12 | 0.2 | 12 | 0.2 | 18 | 0.3 | 18 | 0.3 | 83 | 1.5 |
| CT 9601 | 3,626 | 19 | 0.5 | 4 | 0.1 | 7 | 0.2 | 14 | 0.4 | 12 | 0.3 | 56 | 1.5 |
| BG 1 | 917 | 0 | 0.0 | 0 | 0.0 | 3 | 0.3 | 5 | 0.5 | 0 | 0.0 | 8 | 0.9 |
| BG 3 | 621 | 2 | 0.3 | 1 | 0.2 | 3 | 0.5 | 0 | 0.0 | 3 | 0.5 | 9 | 1.4 |
| BG 5 | 761 | 10 | 1.3 | 0 | 0.0 | 1 | 0.1 | 4 | 0.5 | 2 | 0.3 | 17 | 2.2 |
| Nance | 3,735 | 8 | 0.2 | 10 | 0.3 | 2 | 0.1 | 19 | 0.5 | 37 | 1.0 | 76 | 2.0 |
| CT 9661 | 3,735 | 8 | 0.2 | 10 | 0.3 | 2 | 0.1 | 19 | 0.5 | 37 | 1.0 | 76 | 2.0 |
| BG 2 | 636 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 0.9 | 6 | 0.9 |
| BG 5 | 692 | 3 | 0.4 | 5 | 0.7 | 0 | 0.0 | 5 | 0.7 | 1 | 0.1 | 14 | 2.0 |
| Merrick | 7,845 | 15 | 0.2 | 31 | 0.4 | 66 | 0.8 | 105 | 1.3 | 78 | 1.0 | 295 | 3.8 |
| CT 9666 | 1,947 | 1 | 0.1 | 2 | 0.1 | 5 | 0.3 | 18 | 0.9 | 12 | 0.6 | 38 | 2.0 |
| BG 1 | 804 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 | 7 | 0.9 | 1 | 0.1 | 9 | 1.1 |
| BG 2 | 1,143 | 1 | 0.1 | 2 | 0.2 | 4 | 0.3 | 11 | 1.0 | 11 | 1.0 | 29 | 2.5 |
| Polk | 5,406 | 6 | 0.1 | 11 | 0.2 | 8 | 0.1 | 35 | 0.6 | 54 | 1.0 | 114 | 2.1 |
| CT 9600 | 2,167 | 0 | 0.0 | 4 | 0.2 | 3 | 0.1 | 8 | 0.4 | 16 | 0.7 | 31 | 1.4 |
| BG 1 | 1,119 | 0 | 0.0 | 2 | 0.2 | 0 | 0.0 | 8 | 0.7 | 8 | 0.7 | 18 | 1.6 |
| CT 9601 | 3,239 | 6 | 0.2 | 7 | 0.2 | 5 | 0.2 | 27 | 0.8 | 38 | 1.2 | 83 | 2.6 |
| BG 2 | 661 | 0 | 0.0 | 2 | 0.3 | 1 | 0.2 | 2 | 0.3 | 6 | 0.9 | 11 | 1.7 |
| York | 13,665 | 158 | 1.2 | 58 | 0.4 | 67 | 0.5 | 263 | 1.9 | 139 | 1.0 | 685 | 5.0 |
| CT 9696 | 2,711 | 10 | 0.4 | 8 | 0.3 | 1 | 0.0 | 19 | 0.7 | 23 | 0.8 | 61 | 2.3 |
| BG 2 | 1,233 | 2 | 0.2 | 6 | 0.5 | 1 | 0.1 | 16 | 1.3 | 12 | 1.0 | 37 | 3.0 |
| CT 9698 | 4,634 | 100 | 2.2 | 35 | 0.8 | 33 | 0.7 | 170 | 3.7 | 54 | 1.2 | 392 | 8.5 |
| BG 2 | 1,840 | 78 | 4.2 | 18 | 1.0 | 4 | 0.2 | 96 | 5.2 | 26 | 1.4 | 222 | 12.1 |

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| CT 9699 | 2,436 | 8 | 0.3 | 7 | 0.3 | 5 | 0.2 | 18 | 0.7 | 9 | 0.4 | 47 | 1.9 |
| BG 1 | 1,351 | 5 | 0.4 | 4 | 0.3 | 3 | 0.2 | 10 | 0.7 | 2 | 0.1 | 24 | 1.8 |
| Fillmore | 5,890 | 36 | 0.6 | 28 | 0.5 | 9 | 0.2 | 66 | 1.1 | 48 | 0.8 | 187 | 3.2 |
| CT 916 | 2,319 | 1 | 0.0 | 7 | 0.3 | 2 | 0.1 | 28 | 1.2 | 14 | 0.6 | 52 | 2.2 |
| BG 1 | 1,310 | 0 | 0.0 | 5 | 0.4 | 1 | 0.1 | 14 | 1.1 | 7 | 0.5 | 27 | 2.1 |
| BG 2 | 1,009 | 1 | 0.1 | 2 | 0.2 | 1 | 0.1 | 14 | 1.4 | 7 | 0.7 | 25 | 2.5 |
| Saline | 14,200 | 125 | 0.9 | 55 | 0.4 | 239 | 1.7 | 1,775 | 12.5 | 223 | 1.6 | 2,417 | 17.0 |
| CT 9608 | 1,496 | 4 | 0.3 | 2 | 0.1 | 3 | 0.2 | 22 | 1.5 | 14 | 0.9 | 45 | 3.0 |
| BG 1 | 876 | 2 | 0.2 | 1 | 0.1 | 0 | 0.0 | 9 | 1.0 | 14 | 1.6 | 26 | 3.0 |
| BG 2 | 620 | 2 | 0.3 | 1 | 0.2 | 3 | 0.5 | 13 | 2.1 | 0 | 0.0 | 19 | 3.1 |
| Jefferson | 7,547 | 24 | 0.3 | 27 | 0.4 | 20 | 0.3 | 62 | 0.8 | 91 | 1.2 | 224 | 3.0 |
| CT 9636 | 3,294 | 10 | 0.3 | 3 | 0.1 | 5 | 0.2 | 19 | 0.6 | 22 | 0.7 | 59 | 1.8 |
| BG 1 | 1,266 | 1 | 0.1 | 0 | 0.0 | 3 | 0.2 | 4 | 0.3 | 7 | 0.6 | 15 | 1.2 |
| BG 2 | 705 | 8 | 1.1 | 1 | 0.1 | 1 | 0.1 | 5 | 0.7 | 3 | 0.4 | 18 | 2.6 |
| BG 3 | 1,323 | 1 | 0.1 | 2 | 0.2 | 1 | 0.1 | 10 | 0.8 | 12 | 0.9 | 26 | 2.0 |
| **Kansas** | **2,853,118** | **167,864** | **5.9** | **28,150** | **1.0** | **70,000** | **2.5** | **110,127** | **3.9** | **85,933** | **3.0** | **462,074** | **16.2** |
| Clay | 8,535 | 34 | 0.4 | 38 | 0.4 | 28 | 0.3 | 29 | 0.3 | 105 | 1.2 | 234 | 2.7 |
| CT 4581 | 3,894 | 11 | 0.3 | 12 | 0.3 | 10 | 0.3 | 10 | 0.3 | 49 | 1.3 | 92 | 2.4 |
| BG 2 | 1,339 | 3 | 0.2 | 3 | 0.2 | 2 | 0.1 | 4 | 0.3 | 8 | 0.6 | 20 | 1.5 |
| BG 3 | 1,214 | 4 | 0.3 | 6 | 0.5 | 7 | 0.6 | 3 | 0.2 | 35 | 2.9 | 55 | 4.5 |
| BG 4 | 796 | 1 | 0.1 | 3 | 0.4 | 1 | 0.1 | 1 | 0.1 | 3 | 0.4 | 9 | 1.1 |
| CT 4582 | 4,641 | 23 | 0.5 | 26 | 0.6 | 18 | 0.4 | 19 | 0.4 | 56 | 1.2 | 142 | 3.1 |
| BG 1 | 622 | 4 | 0.6 | 2 | 0.3 | 9 | 1.4 | 5 | 0.8 | 7 | 1.1 | 27 | 4.3 |

## Table 1 Minority Data for All Geographic Areas

| Geographic Area | Population | African American | | American Indian/Alaskan Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| Butler | 65,880 | 1,096 | 1.7 | 636 | 1.0 | 512 | 0.8 | 599 | 0.9 | 1,461 | 2.2 | 4,304 | 6.5 |
| CT 0201 | 6,253 | 484 | 7.7 | 71 | 1.1 | 12 | 0.2 | 22 | 0.4 | 70 | 1.1 | 659 | 10.5 |
| BG 1 | 1,564 | 16 | 1.0 | 10 | 0.6 | 2 | 0.1 | 6 | 0.4 | 19 | 1.2 | 53 | 3.4 |
| CT 0206 | 7,687 | 40 | 0.5 | 75 | 1.0 | 44 | 0.6 | 61 | 0.8 | 160 | 2.1 | 380 | 4.9 |
| BG 2 | 691 | 1 | 0.1 | 11 | 1.6 | 4 | 0.6 | 10 | 1.4 | 21 | 3.0 | 47 | 6.8 |

Sources: Total population and minority populations for each race (Race, U.S. Census Bureau 2012b).

Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
Values less than 0.1 percent are expressed as 0.0 percent.
CT = Census Tract, BG = Block Group
Minority geographic areas identified in the table may not be the same as those identified in the Final Environmental Impact Statement (EIS) dated August 26, 2011. The Final EIS used 2000 census data, while this analysis used 2010 census data. In some cases, discrepancies are due to changes in demographics between 2000 and 2010. For instance, the Final EIS identified block group 000100-2 in Fallon County, Montana, as minority in 2000, but 2010 data shows that the minority population in this block group has declined. Other discrepancies can be attributed to the geographic reconfiguration of block groups between 2000 and 2010. For example, a block group in Meade County, South Dakota, that met the minority population criterion in 2000 does not meet the criterion based on 2010 data because the block group configuration changed to incorporate areas with a different racial breakdown.

## Table 2 Hispanic and Latino Origin Data for All Geographic Areas

| Geographic Area | Population # | Hispanic or Latino # | Hispanic or Latino % |
|---|---|---|---|
| **United States** | 308,745,538 | 50,477,594 | 16.3 |
| **Montana** | 989,415 | 28,565 | 2.9 |
| Phillips | 4,253 | 81 | 1.9 |
| CT 602 | 4,253 | 81 | 1.9 |
| BG 4 | 1,139 | 25 | 2.2 |
| Valley | 7,369 | 91 | 1.2 |
| CT 1001 | 1,513 | 8 | 0.5 |
| BG 1 | 659 | 8 | 1.2 |
| BG 2 | 854 | 0 | 0.0 |
| CT 9406 | 3,063 | 33 | 1.1 |
| BG 1 | 808 | 11 | 1.4 |
| BG 2 | 1,003 | 10 | 1.0 |
| BG 3 | 1,252 | 14 | 1.1 |
| McCone | 1,734 | 13 | 0.7 |
| CT 9540 | 1,734 | 13 | 0.7 |
| BG 1 | 1,018 | 3 | 0.3 |
| BG 2 | 716 | 11 | 1.5 |
| Dawson | 8,966 | 178 | 2.0 |
| CT 1 | 1,456 | 11 | 0.8 |
| BG 1 | 744 | 10 | 1.3 |
| BG 2 | 712 | 3 | 0.4 |
| Prairie | 1,179 | 16 | 1.4 |
| CT 1 | 1,179 | 16 | 1.4 |
| BG 1 | 1,179 | 19 | 1.6 |
| Fallon | 2,890 | 34 | 1.2 |
| CT 1 | 2,890 | 34 | 1.2 |
| BG 1 | 913 | 6 | 0.7 |
| BG 2 | 1,104 | 22 | 2.0 |
| BG 3 | 873 | 11 | 1.3 |
| Carter | 1,160 | 8 | 0.7 |
| CT 3 | 1,160 | 8 | 0.7 |
| BG 1 | 615 | 6 | 1.0 |
| BG 2 | 545 | 4 | 0.7 |
| **South Dakota** | 814,180 | 22,119 | 2.7 |
| Harding | 1,255 | 20 | 1.6 |
| CT 9687 | 1,255 | 20 | 1.6 |
| BG 1 | 1,255 | 24 | 1.9 |

## Table 2 Hispanic and Latino Origin Data for All Geographic Areas

| | Population | Hispanic or Latino | |
|---|---|---|---|
| Butte | 10,110 | 306 | 3.0 |
| CT 9676 | 2,972 | 56 | 1.9 |
| BG 1 | 1,177 | 36 | 3.1 |
| Perkins | 2,982 | 20 | 0.7 |
| CT 9683 | 2,982 | 20 | 0.7 |
| BG 2 | 981 | 10 | 1.0 |
| Meade | 25,434 | 773 | 3.0 |
| CT 205 | 4,380 | 235 | 5.4 |
| BG 2 | 837 | 18 | 2.2 |
| BG 3 | 1,086 | 17 | 1.6 |
| Ziebach | 2,801 | 87 | 3.1 |
| CT 9416 | 2,801 | 87 | 3.1 |
| BG 1 | 1,805 | 64 | 3.5 |
| Pennington | 100,948 | 4,044 | 4.0 |
| CT 116 | 6,720 | 207 | 3.1 |
| BG 1 | 1,123 | 12 | 1.1 |
| Haakon | 1,937 | 17 | 0.9 |
| CT 9601 | 1,937 | 17 | 0.9 |
| BG 2 | 978 | 9 | 0.9 |
| Jones | 1,006 | 13 | 1.3 |
| CT 916 | 1,006 | 13 | 1.3 |
| BG 1 | 1,006 | 13 | 1.3 |
| Lyman | 3,755 | 42 | 1.1 |
| CT 9726 | 2,275 | 21 | 0.9 |
| BG 1 | 915 | 12 | 1.3 |
| Tripp | 5,644 | 60 | 1.1 |
| CT 9716 | 2,261 | 16 | 0.7 |
| BG 1 | 1,035 | 7 | 0.7 |
| BG 2 | 1,226 | 11 | 0.9 |
| CT 9717 | 3,383 | 44 | 1.3 |
| BG 1 | 1,411 | 28 | 2.0 |
| BG 2 | 1,074 | 27 | 2.5 |
| BG 3 | 898 | 8 | 0.9 |
| Gregory | 4,271 | 38 | 0.9 |
| CT 9712 | 2,190 | 19 | 0.9 |
| BG 2 | 1,379 | 7 | 0.5 |

**Table 2 Hispanic and Latino Origin Data for All Geographic Areas**

| | Population | Hispanic or Latino | |
|---|---|---|---|
| **Nebraska** | 1,826,341 | 167,405 | 9.2 |
| Keya Paha | 824 | 4 | 0.5 |
| CT 9754 | 824 | 4 | 0.5 |
| BG 1 | 824 | 4 | 0.5 |
| Boyd | 2,099 | 33 | 1.6 |
| CT 9758 | 2,099 | 33 | 1.6 |
| BG 2 | 816 | 7 | 0.9 |
| Holt | 10,435 | 305 | 2.9 |
| CT 9740 | 1,645 | 15 | 0.9 |
| BG 1 | 621 | 11 | 1.8 |
| BG 2 | 1,024 | 4 | 0.4 |
| CT 9741 | 2,564 | 12 | 0.5 |
| BG 1 | 1,154 | 2 | 0.2 |
| CT 9742 | 1,910 | 7 | 0.4 |
| BG 1 | 1,133 | 5 | 0.4 |
| CT 9743 | 4,316 | 271 | 6.3 |
| BG 1 | 826 | 22 | 2.7 |
| Antelope | 6,685 | 178 | 2.7 |
| CT 9796 | 2,146 | 21 | 1.0 |
| BG 1 | 643 | 1 | 0.2 |
| BG 2 | 582 | 3 | 0.5 |
| BG 3 | 921 | 19 | 2.1 |
| CT 9798 | 2,781 | 89 | 3.2 |
| BG 3 | 1,037 | 22 | 2.1 |
| Boone | 5,505 | 65 | 1.2 |
| CT 9601 | 3,626 | 35 | 1.0 |
| BG 1 | 917 | 10 | 1.1 |
| BG 3 | 621 | 2 | 0.3 |
| BG 5 | 761 | 11 | 1.4 |
| Nance | 3,735 | 65 | 1.7 |
| CT 9661 | 3,735 | 65 | 1.7 |
| BG 2 | 636 | 9 | 1.4 |
| BG 5 | 692 | 8 | 1.2 |
| Merrick | 7,845 | 290 | 3.7 |
| CT 9666 | 1,947 | 49 | 2.5 |
| BG 1 | 804 | 17 | 2.1 |
| BG 2 | 1,143 | 37 | 3.2 |

## Table 2 Hispanic and Latino Origin Data for All Geographic Areas

| | Population | Hispanic or Latino | |
|---|---|---|---|
| Polk | 5,406 | 156 | 2.9 |
| CT 9600 | 2,167 | 19 | 0.9 |
| BG 1 | 1,119 | 14 | 1.3 |
| CT 9601 | 3,239 | 137 | 4.2 |
| BG 2 | 661 | 19 | 2.9 |
| York | 13,665 | 555 | 4.1 |
| CT 9696 | 2,711 | 54 | 2.0 |
| BG 2 | 1,233 | 41 | 3.3 |
| CT 9698 | 4,634 | 292 | 6.3 |
| BG 2 | 1,840 | 147 | 8.0 |
| CT 9699 | 2,436 | 52 | 2.1 |
| BG 1 | 1,351 | 29 | 2.1 |
| Fillmore | 5,890 | 178 | 3.0 |
| CT 916 | 2,319 | 72 | 3.1 |
| BG 1 | 1,310 | 49 | 3.7 |
| BG 2 | 1,009 | 29 | 2.9 |
| Saline | 14,200 | 2,870 | 20.2 |
| CT 9608 | 1,496 | 40 | 2.7 |
| BG 1 | 876 | 25 | 2.9 |
| BG 2 | 620 | 19 | 3.1 |
| Jefferson | 7,547 | 200 | 2.7 |
| CT 9636 | 3,294 | 69 | 2.1 |
| BG 1 | 1,266 | 27 | 2.1 |
| BG 2 | 705 | 13 | 1.8 |
| BG 3 | 1,323 | 39 | 2.9 |
| **Kansas** | 2,853,118 | 300,042 | 10.5 |
| Clay | 8,535 | 162 | 1.9 |
| CT 4581 | 3,894 | 83 | 2.1 |
| BG 2 | 1,339 | 31 | 2.3 |
| BG 3 | 1,214 | 39 | 3.2 |
| BG 4 | 796 | 14 | 1.8 |
| CT 4582 | 4,641 | 79 | 1.7 |
| BG 1 | 622 | 15 | 2.4 |
| Butler | 65,880 | 2,602 | 3.9 |
| CT 201 | 6,253 | 261 | 4.2 |
| BG 1 | 1,564 | 31 | 2.0 |
| CT 206 | 7,687 | 208 | 2.7 |
| BG 2 | 691 | 25 | 3.6 |

## Table 2 Hispanic and Latino Origin Data for All Geographic Areas

Sources: Hispanic and Latino populations (Hispanic or Latino Origin by Race, U.S. Census Bureau 2012c).

[a] Hispanic and Latino populations are not included in the aggregate minority count.
Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
CT = Census Tract, BG = Block Group
Minority geographic areas identified in the table may not be the same as those identified in the Final EIS dated August 26, 2011. The Final EIS used 2000 census data, while this analysis used 2010 census data. In some cases, discrepancies are due to changes in demographics between 2000 and 2010. For instance, the Final EIS identified block group 000100-2 in Fallon County, Montana, as minority in 2000, but 2010 data shows that the minority population in this block group has declined. Other discrepancies can be attributed to the geographic reconfiguration of block groups between 2000 and 2010. For example, a block group in Meade County, South Dakota that met the minority population criterion in 2000 does not meet the criterion based on 2010 data because the block group configuration changed to incorporate areas with a different racial breakdown.

## Table 3 Low-Income Data for All Geographic Areas

| Geographic Area | Population for Whom Poverty Status is Determined | Aggregate (Total) of Low-Income Populations | |
|---|---|---|---|
| | # | # | % |
| **United States** | **296,141,149** | **40,917,513** | **13.8** |
| **Montana** | **949,414** | **138,109** | **14.5** |
| Phillips | 3,986 | 537 | 13.5 |
| CT 602 | 3,986 | 537 | 13.5 |
| Valley | 7,155 | 722 | 10.1 |
| CT 1001 | 1,471 | 111 | 7.5 |
| CT 9406 | 2,922 | 368 | 12.6 |
| McCone | 1,714 | 147 | 8.6 |
| CT 9540 | 1,714 | 147 | 8.6 |
| Dawson | 8,045 | 746 | 9.3 |
| CT 1 | 1,401 | 116 | 8.3 |
| Prairie | 1,079 | 182 | 16.9 |
| CT 1 | 1,079 | 182 | 16.9 |
| Fallon | 2,802 | 238 | 8.5 |
| CT 1 | 2,802 | 238 | 8.5 |
| Carter | 1,269 | 178 | 14.0 |
| CT 3 | 1,269 | 178 | 14.0 |
| **South Dakota** | **771,100** | **105,819** | **13.7** |
| Harding | 1,233 | 199 | 16.1 |
| CT 9687 | 1,233 | 199 | 16.1 |
| Butte | 9,782 | 1,529 | 15.6 |
| CT 9676 | 2,932 | 573 | 19.5 |
| Perkins | 2,904 | 543 | 18.7 |
| CT 9683 | 2,904 | 543 | 18.7 |
| Meade | 24,266 | 2,456 | 10.1 |
| CT 205 | 4,747 | 718 | 15.1 |
| Ziebach | 2,742 | 1,260 | 46.0 |
| CT 9416 | 2,742 | 1,260 | 46.0 |
| Pennington | 95,723 | 13,423 | 14.0 |
| CT 116 | 6,490 | 622 | 9.6 |
| Haakon | 1,684 | 211 | 12.5 |
| CT 9601 | 1,684 | 211 | 12.5 |
| Jones | 1,056 | 96 | 9.1 |
| CT 916 | 1,056 | 96 | 9.1 |
| Lyman | 3,720 | 699 | 18.8 |
| CT 9726 | 2,128 | 171 | 8.0 |

## Table 3 Low-Income Data for All Geographic Areas

| Geographic Area | Population for Whom Poverty Status is Determined | Aggregate (Total) of Low-Income Populations | |
|---|---|---|---|
| | # | # | % |
| Tripp | 5,635 | 927 | 16.5 |
| CT 9716 | 2,326 | 360 | 15.5 |
| CT 9717 | 3,309 | 567 | 17.1 |
| Gregory | 4,169 | 669 | 16.0 |
| CT 9712 | 2,204 | 328 | 14.9 |
| **Nebraska** | **1,744,704** | **206,227** | **11.8** |
| Keya Paha | 740 | 168 | 22.7 |
| CT 9754 | 740 | 168 | 22.7 |
| Boyd | 2,052 | 170 | 8.3 |
| CT 9758 | 2,052 | 170 | 8.3 |
| Holt | 10,186 | 794 | 7.8 |
| CT 9740 | 1521 | 95 | 6.2 |
| CT 9741 | 2803 | 213 | 7.6 |
| CT 9742 | 1855 | 128 | 6.9 |
| CT 9743 | 4007 | 358 | 8.9 |
| Antelope | 6,540 | 745 | 11.4 |
| CT 9796 | 2051 | 202 | 9.8 |
| CT 9798 | 2822 | 256 | 9.1 |
| Boone | 5,433 | 360 | 6.6 |
| CT 9601 | 3482 | 248 | 7.1 |
| Nance | 3,531 | 346 | 9.8 |
| CT 9661 | 3531 | 346 | 9.8 |
| Merrick | 7,760 | 832 | 10.7 |
| CT 9666 | 1699 | 88 | 5.2 |
| Polk | 5,403 | 375 | 6.9 |
| CT 9600 | 2122 | 144 | 6.8 |
| CT 9601 | 3281 | 231 | 7.0 |
| York | 12,699 | 890 | 7.0 |
| CT 9696 | 2533 | 136 | 5.4 |
| CT 9698 | 3919 | 377 | 9.6 |
| CT 9699 | 2308 | 131 | 5.7 |
| Fillmore | 5,559 | 652 | 11.7 |
| CT 916 | 2200 | 211 | 9.6 |
| Saline | 12,871 | 1,539 | 12.0 |
| CT 9608 | 1600 | 112 | 7.0 |
| Jefferson | 7,668 | 958 | 12.5 |
| CT 9636 | 3255 | 222 | 6.8 |

### Table 3 Low-Income Data for All Geographic Areas

| Geographic Area | Population for Whom Poverty Status is Determined | Aggregate (Total) of Low-Income Populations | |
|---|---|---|---|
| | # | # | % |
| **Kansas** | **2,725,175** | **338,792** | **12.4** |
| Clay | 8,232 | 743 | 9.0 |
| CT 4581 | 3,907 | 372 | 9.5 |
| CT 4582 | 4,325 | 371 | 8.6 |
| Butler | 63,003 | 4,594 | 7.3 |
| CT 201 | 5,024 | 350 | 7.0 |
| CT 206 | 7,624 | 376 | 4.9 |

Source: 2006-2010 Poverty Status in the Past 12 Months (U.S. Census Bureau 2012a).

Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
CT = Census Tract
Low-income geographic areas identified in the table may not be the same as those identified in the Final EIS dated August 26, 2011. The Final EIS used data from the U.S. 2000 census (1999 data), while this Supplemental EIS analysis used 2006-2010 American Community Survey data. In some cases, discrepancies are due to changes in demographics between 1999 and 2010. Additional discrepancies can be attributed to the reconfiguration of block groups and census tracts over time. For instance, Valley County, Montana, had a small low-income block group surrounded by non-low-income block groups in 2000. The Final EIS identified it as having a low-income population, but after 2000 this block group was merged into the surrounding groups and the resulting census tract does not meet the low-income criterion. Additionally, the Final EIS analyzed low-income data on a block group level, while the Supplemental EIS uses census tracts since block group-level data is not currently available. In some cases the Final EIS identified a block group as having a meaningfully greater low-income population, but its corresponding census tract does not have one.

## Table 4 County Minority Populations Meaningfully Greater than Corresponding States' Minority Population

| | Total Population | African American | | American Indian or Alaskan Native | | Asian or Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | | Hispanic or Latino | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| **Montana** | | | | | | | | | | | | | | | |
| Phillips | 4,253 | 1 | 0.0 | 351 | 8.3 | 11 | 0.3 | 17 | 0.4 | 171 | 4.0 | 551 | 13.0 | 87 | 2.0 |
| Valley | 7,369 | 17 | 0.2 | 724 | 9.8 | 40 | 0.5 | 24 | 0.3 | 155 | 2.1 | 960 | 13.0 | 91 | 1.2 |
| *Montana Exceedance Criteria* | | *0.5%* | | *7.6%* | | *0.8%* | | *0.7%* | | *3.0%* | | *12.7%* | | *3.5%* | |
| **South Dakota** | | | | | | | | | | | | | | | |
| Butte | 10,110 | 22 | 0.2 | 189 | 1.9 | 30 | 0.3 | 82 | 0.8 | 261 | 2.6 | 584 | 5.8 | 306 | 3.0 |
| Meade | 25,434 | 319 | 1.3 | 597 | 2.3 | 184 | 0.7 | 196 | 0.8 | 733 | 2.9 | 2,029 | 8.0 | 773 | 3.0 |
| Ziebach | 2,801 | 6 | 0.2 | 2,097 | 74.9 | 2 | 0.1 | 3 | 0.1 | 83 | 3.0 | 2,191 | 78.2 | 87 | 3.1 |
| Pennington | 100,948 | 1,050 | 1.0 | 9,748 | 9.7 | 1,132 | 1.1 | 813 | 0.8 | 3,855 | 3.8 | 16,598 | 16.4 | 4,044 | 4.0 |
| Haakon | 1,937 | 3 | 0.2 | 37 | 1.9 | 9 | 0.5 | 4 | 0.2 | 50 | 2.6 | 103 | 5.3 | 17 | 0.9 |
| Lyman | 3,755 | 3 | 0.1 | 1,436 | 38.2 | 11 | 0.3 | 5 | 0.1 | 109 | 2.9 | 1,564 | 41.7 | 42 | 1.1 |
| Tripp | 5,644 | 6 | 0.1 | 788 | 14.0 | 12 | 0.2 | 13 | 0.2 | 136 | 2.4 | 955 | 16.9 | 60 | 1.1 |
| *South Dakota Exceedance Criteria* | | *1.5%* | | *10.6%* | | *1.2%* | | *1.1%* | | *2.5%* | | *16.9%* | | *3.2%* | |
| **Nebraska** | | | | | | | | | | | | | | | |
| Saline | 14,200 | 125 | 0.9 | 55 | 0.4 | 239 | 1.7 | 1,775 | 12.5 | 223 | 1.6 | 2,417 | 17.0 | 2,870 | 20.2 |
| *Nebraska Exceedance Criteria* | | *5.4%* | | *1.2%* | | *2.2%* | | *5.2%* | | *2.6%* | | *16.7%* | | *11.0%* | |

Sources: Total population and minority populations for each race (Race, U.S. Census Bureau 2012b), Hispanic and Latino populations (Race and Hispanic or Latino Origin, U.S. Census Bureau 2012c).

[a] Hispanic and Latino populations are not included in the aggregate minority count.
Note: Values less than 0.1 percent are expressed as 0.0 percent.
Minority geographic areas identified in the table may not be the same as those identified in the Final EIS dated August 26, 2011. The Final EIS used 2000 census data, while this analysis used 2010 census data. In some cases, discrepancies are due to changes in demographics between 2000 and 2010. For instance, the Final EIS identified block group 000100-2 in Fallon County, Montana as minority in 2000, but 2010 data shows that minority populations in the block group have since decreased. Discrepancies can also be attributed to the reconfiguration of block groups over time. A minority population in a Meade County, South Dakota block group from 2000 is no longer minority because the block group configuration has changed to incorporate areas with a different racial breakdown.

**Table 5 County Low-Income Populations Meaningfully Greater than Corresponding States' Low-Income Population**

| | Population for Whom Poverty Status is Determined | Aggregate (Total) of Low-Income Populations | |
|---|---|---|---|
| | **Number** | **Number** | **Percent** |
| **South Dakota** | | | |
| Perkins | 2,904 | 543 | 18.7 |
| Ziebach | 2,742 | 1,260 | 46.0 |
| Lyman | 3,720 | 699 | 18.8 |
| Tripp | 5,635 | 927 | 16.5 |
| *South Dakota Exceedance Criteria* | | | *16.5* |
| **Nebraska** | | | |
| Keya Paha | 740 | 168 | 22.7 |
| *Nebraska Exceedance Criteria* | | | *14.2* |

Source: Poverty Status in the Past 12 Months, U.S. Census Bureau 2006-2010 (U.S. Census Bureau 2012a).

Note: Low-income geographic areas identified in the table may not be the same as those identified in the Final EIS dated August 2011. The Final EIS used 1999 ACS data, while this analysis used 2010 ACS data. In some cases, discrepancies are due to changes in demographics between 1999 and 2010. Additional discrepancies can be attributed to the reconfiguration of block groups and census tracts over time. For instance, Valley County, Montana had a small low-income block group surrounded by non-low-income block groups in 1999. In the 2010 ACS, this block group was dissolved into the surrounding groups and therefore lost its low-income designation. Additionally, the Final EIS used analyzed low-income data on a block group level, while the data presented above was analyzed on a census tract level. In several cases, an individual block group was identified as low-income on its own, but its corresponding census tract as a whole was not.

## Table 6 Total Employment by Industry Supported by Construction of the Proposed Project, Montana and South Dakota (average annual jobs)

| Industry | Montana [a] Current (2010) Jobs [b] | Montana [a] Total Effects of Proposed Project Jobs [b] | Montana [a] Total Effects of Proposed Project Share of 2010 | South Dakota [a] Current (2010) Jobs [b] | South Dakota [a] Total Effects of Proposed Project Jobs [b] | South Dakota [a] Total Effects of Proposed Project Share of 2010 |
|---|---|---|---|---|---|---|
| Farm | 28,817 | 4 | 0.0% | 31,776 | 3 | 0.0% |
| Forestry, Fisheries & Support, including Farm Support | 6,796 | 4 | 0.1% | 4,682 | 2 | 0.0% |
| Mining | 10,367 | 5 | 0.0% | 1,983 | 3 | 0.1% |
| Utilities | 3,169 | 11 | 0.4% | 2,180 | 10 | 0.4% |
| Construction | 41,684 | 357 | 0.9% | 32,217 | 319 | 1.0% |
| Manufacturing | 20,470 | 109 | 0.5% | 39,151 | 114 | 0.3% |
| Trade | 88,794 | 441 | 0.5% | 83,456 | 446 | 0.5% |
| Transportation & Warehousing | 17,651 | 216 | 1.2% | 15,003 | 198 | 1.3% |
| Information | 9,019 | 49 | 0.5% | 7,636 | 37 | 0.5% |
| Finance & Insurance | 26,207 | 154 | 0.6% | 37,772 | 186 | 0.5% |
| Real estate & rental | 29,121 | 200 | 0.7% | 17,989 | 163 | 0.9% |
| Professional Services & Management of Companies | 35,442 | 619 | 1.7% | 23,329 | 521 | 2.2% |
| Administrative & Waste Services (private only) | 27,061 | 169 | 0.6% | 18,942 | 93 | 0.5% |
| Educational Services (private only) | 7,923 | 17 | 0.2% | 10,283 | 13 | 0.1% |
| Health & Social Services (private only) | 68,321 | 169 | 0.2% | 64,695 | 135 | 0.2% |
| Arts, Entertainment & Recreation Services | 18,508 | 55 | 0.3% | 11,309 | 31 | 0.3% |
| Accommodations & Food Services | 49,696 | 872 | 1.8% | 40,406 | 977 | 2.4% |
| Other Services | 37,417 | 173 | 0.5% | 28,043 | 165 | 0.6% |
| Government & Government Enterprises | 97,185 | 30 | 0.0% | 85,615 | 31 | 0.0% |
| Total | 623,648 | 3,656 | 0.6% | 556,467 | 3,443 | 0.6% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work.
Note: Values less than 0.1 percent are expressed as 0.0 percent.

**Table 7 Total Employment by Industry Supported by Construction of the Proposed Project, Nebraska (average annual jobs)**

| Industry | Economic Corridor Only [a] | | | State Total [a] | | |
|---|---|---|---|---|---|---|
| | Current (2010) Jobs [b] | Total Effects of Proposed Project Jobs [b] | Total Effects of Proposed Project Share of 2010 | Current (2010) Jobs [b] | Total Effects of Proposed Project Jobs [b] | Total Effects of Proposed Project Share of 2010 |
| Farm | 12,984 | 0 | 0.0% | 51,567 | 3 | 0.0% |
| Forestry, Fisheries & Support, including Farm Support | 720 | 0 | 0.0% | 9,472 | 1 | 0.0% |
| Mining | 222 | 0 | 0.0% | 2,628 | 4 | 0.1% |
| Utilities | 202 | 1 | 0.3% | 1,826 | 2 | 0.1% |
| Construction | 8,445 | 7 | 0.1% | 64,391 | 274 | 0.4% |
| Manufacturing | 22,199 | 4 | 0.0% | 95,145 | 170 | 0.2% |
| Trade | 27,520 | 94 | 0.3% | 173,609 | 542 | 0.3% |
| Transportation & Warehousing | 6,728 | 10 | 0.1% | 60,617 | 231 | 0.4% |
| Information | 1,362 | 13 | 1.0% | 19,126 | 52 | 0.3% |
| Finance & Insurance | 9,763 | 22 | 0.2% | 80,292 | 221 | 0.3% |
| Real estate & rental | 3,875 | 11 | 0.3% | 37,301 | 226 | 0.6% |
| Professional Services & Management of Companies | 4,644 | 21 | 0.4% | 78,819 | 569 | 0.7% |
| Administrative & Waste Services (private only) | 6,611 | 35 | 0.5% | 57,148 | 207 | 0.4% |
| Educational Services (private only) | 1,682 | 2 | 0.1% | 22,816 | 25 | 0.1% |
| Health & Social Services (private only) | 16,736 | 31 | 0.2% | 130,815 | 220 | 0.2% |
| Arts, Entertainment & Recreation Services | 2,131 | 8 | 0.4% | 21,856 | 48 | 0.2% |
| Accommodations & Food Services | 8,488 | 1,146 | 13.5% | 74,246 | 1,390 | 1.9% |
| Other Services | 8,541 | 23 | 0.3% | 66,935 | 207 | 0.3% |
| Government & Government Enterprises | 24,342 | 19 | 0.1% | 177,058 | 57 | 0.0% |
| Total | 167,195 | 1,446 | 0.9% | 1,225,667 | 4,448 | 0.4% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work.
Note: Values less than 0.1 percent are expressed as 0.0 percent.

**Table 8 Total Employment by Industry Supported by Construction of the Proposed Project, Kansas and the United States (average annual jobs)**

| | Kansas [a] | | | United States [c] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| Industry | Jobs [b] | Jobs [b] | Share of 2010 | Jobs [b] | Jobs [b] | Share of 2010 |
| Farm | 65,033 | 0 | 0.00% | 2,665,000 | 285 | 0.01% |
| Forestry, Fisheries & Support, including Farm Support | 8,792 | 0 | 0.00% | 835,800 | 117 | 0.01% |
| Mining | 32,021 | 1 | 0.00% | 1,185,500 | 288 | 0.02% |
| Utilities | 8,006 | 1 | 0.02% | 579,000 | 139 | 0.02% |
| Construction | 85,945 | 22 | 0.03% | 8,914,200 | 6,801 | 0.08% |
| Manufacturing | 166,804 | 10 | 0.01% | 12,206,900 | 4,552 | 0.04% |
| Trade | 244,410 | 38 | 0.02% | 23,808,200 | 4,364 | 0.02% |
| Transportation & Warehousing | 55,368 | 8 | 0.01% | 5,504,400 | 2,033 | 0.04% |
| Information | 33,237 | 6 | 0.02% | 3,210,700 | 573 | 0.02% |
| Finance & Insurance | 96,177 | 17 | 0.02% | 9,651,300 | 2,177 | 0.02% |
| Real estate & rental | 56,979 | 10 | 0.02% | 7,459,200 | 1,608 | 0.02% |
| Professional Services & Management of Companies | 109,768 | 51 | 0.05% | 13,765,700 | 5,065 | 0.04% |
| Administrative & Waste Services (private only) | 94,824 | 21 | 0.02% | 10,478,800 | 2,317 | 0.02% |
| Educational Services (private only) | 25,896 | 2 | 0.01% | 4,076,600 | 460 | 0.01% |
| Health & Social Services (private only) | 188,923 | 17 | 0.01% | 19,062,300 | 2,717 | 0.01% |
| Arts, Entertainment & Recreation Services | 27,441 | 4 | 0.01% | 3,777,100 | 634 | 0.02% |
| Accommodations & Food Services | 109,251 | 181 | 0.17% | 12,048,000 | 5,749 | 0.05% |
| Other Services | 93,614 | 18 | 0.02% | 9,858,700 | 1,794 | 0.02% |
| Government & Government Enterprises | 302,753 | 4 | 0.00% | 24,680,000 | 400 | 0.00% |
| Total | 1,805,242 | 412 | 0.02% | 173,767,400 | 42,073 | 0.02% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work.
[c] Includes all full-time and part-time jobs regardless of location within U.S.
Note: Values less than 0.01 percent are expressed as 0.00 percent.

**Table 9 Total Earnings by Industry Supported by Construction of the Proposed Project, Montana and South Dakota (thousands of 2010 dollars)**

| Industry | Montana[a] Current (2010) $1,000[b] | Montana[a] Total Effects of Proposed Project $1,000[b] | Montana[a] Total Effects of Proposed Project Share of 2010 | South Dakota[a] Current (2010) $1,000[b] | South Dakota[a] Total Effects of Proposed Project $1,000[b] | South Dakota[a] Total Effects of Proposed Project Share of 2010 |
|---|---|---|---|---|---|---|
| Farm | 584,113 | 57 | 0.0% | 2,408,458 | 173 | 0.0% |
| Forestry, Fisheries & Support, including Farm Support | 162,574 | 125 | 0.1% | 121,559 | 45 | 0.0% |
| Mining | 664,002 | 306 | 0.0% | 54,975 | 122 | 0.2% |
| Utilities | 354,376 | 1,309 | 0.4% | 199,052 | 915 | 0.5% |
| Construction | 1,711,999 | 17,037 | 1.0% | 1,346,264 | 15,465 | 1.1% |
| Manufacturing | 1,031,332 | 5,198 | 0.5% | 1,990,690 | 6,046 | 0.3% |
| Trade | 2,885,777 | 14,597 | 0.5% | 2,813,605 | 14,961 | 0.5% |
| Transportation & Warehousing | 913,007 | 10,779 | 1.2% | 699,904 | 9,878 | 1.4% |
| Information | 393,005 | 2,167 | 0.6% | 345,770 | 1,597 | 0.5% |
| Finance & Insurance | 1,068,898 | 6,726 | 0.6% | 1,537,041 | 7,934 | 0.5% |
| Real estate & rental | 363,157 | 3,471 | 1.0% | 291,665 | 2,580 | 0.9% |
| Professional Services & Management of Companies | 1,586,798 | 30,568 | 1.9% | 1,227,650 | 23,493 | 1.9% |
| Administrative & Waste Services (private only) | 696,111 | 4,030 | 0.6% | 452,286 | 1,986 | 0.4% |
| Educational Services (private only) | 144,888 | 356 | 0.2% | 236,258 | 324 | 0.1% |
| Health & Social Services (private only) | 3,163,291 | 7,830 | 0.2% | 3,165,948 | 6,757 | 0.2% |
| Arts, Entertainment & Recreation Services | 294,479 | 582 | 0.2% | 249,821 | 578 | 0.2% |
| Accommodations & Food Services | 929,225 | 13,959 | 1.5% | 689,960 | 14,515 | 2.1% |
| Other Services | 1,002,215 | 6,046 | 0.6% | 804,951 | 5,469 | 0.7% |
| Government & Government Enterprises | 5,441,042 | 2,024 | 0.0% | 4,332,428 | 1,752 | 0.0% |
| Total | 23,390,289 | 127,167 | 0.5% | 22,968,285 | 114,592 | 0.5% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
Note: Values less than 0.1 percent are expressed as 0.0 percent.

## Table 10 Total Earnings by Industry Supported by Construction of the Proposed Project, Nebraska (thousands of 2010 dollars)

| | Economic Corridor Only[a] | | | State Total[a] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| **Industry** | **$1,000 [b]** | **$1,000 [b]** | **Share of 2010** | **$1,000 [b]** | **$1,000 [b]** | **Share of 2010** |
| Farm | 943,803 | 34 | 0.0% | 3,440,216 | 221 | 0.0% |
| Forestry, Fisheries & Support, including Farm Support | 27484 | 1 | 0.0% | 214,327 | 17 | 0.0% |
| Mining | 8492 | 1 | 0.0% | 80,108 | 256 | 0.3% |
| Utilities | 7502 | 173 | 2.3% | 445,391 | 564 | 0.1% |
| Construction | 324,147 | 241 | 0.1% | 3,213,079 | 12,950 | 0.4% |
| Manufacturing | 858,253 | 170 | 0.0% | 5,364,786 | 8,256 | 0.2% |
| Trade | 885,391 | 2,377 | 0.3% | 6,097,694 | 18,070 | 0.3% |
| Transportation & Warehousing | 256,548 | 300 | 0.1% | 3,882,163 | 11,071 | 0.3% |
| Information | 52,033 | 399 | 0.8% | 1,201,778 | 2,447 | 0.2% |
| Finance & Insurance | 373,751 | 773 | 0.2% | 3,999,558 | 10,365 | 0.3% |
| Real estate & rental | 146,566 | 105 | 0.1% | 558,859 | 3,237 | 0.6% |
| Professional Services & Management of Companies | 178,370 | 802 | 0.4% | 5,239,812 | 34,835 | 0.7% |
| Administrative & Waste Services (private only) | 254,627 | 645 | 0.3% | 1,594,970 | 5,164 | 0.3% |
| Educational Services (private only) | 64,672 | 56 | 0.1% | 675,835 | 825 | 0.1% |
| Health & Social Services (private only) | 641,016 | 1,200 | 0.2% | 6,025,929 | 10,162 | 0.2% |
| Arts, Entertainment & Recreation Services | 81,677 | 58 | 0.1% | 297,175 | 515 | 0.2% |
| Accommodations & Food Services | 325,337 | 15,177 | 4.7% | 1,246,801 | 19,509 | 1.6% |
| Other Services | 255,919 | 649 | 0.3% | 1,949,269 | 6,698 | 0.3% |
| Government & Government Enterprises | 1,181,348 | 1,351 | 0.1% | 10,000,089 | 4,228 | 0.0% |
| Total | 6,866,936 | 24,512 | 0.4% | 55,527,839 | 149,391 | 0.3% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
Note: Values less than 0.1 percent are expressed as 0.0 percent.

## Table 11 Total Earnings by Industry Supported by Construction of the Proposed Project, Kansas and the United States (thousands of 2010 dollars)

| Industry | Kansas [a] | | | United States [c] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| | $1,000 [b] | $1,000 [b] | Share of 2010 | $1,000 [b] | $1,000 [b] | Share of 2010 |
| Farm | 2,219,064 | 12 | 0.00% | 77,215,000 | 7,359 | 0.01% |
| Forestry, Fisheries & Support, including Farm Support | 317,548 | 2 | 0.00% | 22,548,000 | 3,783 | 0.02% |
| Mining | 785,580 | 37 | 0.00% | 83,081,000 | 28,313 | 0.03% |
| Utilities | 880,257 | 148 | 0.02% | 73,306,000 | 18,384 | 0.03% |
| Construction | 4,192,163 | 1,241 | 0.03% | 479,541,000 | 419,524 | 0.09% |
| Manufacturing | 11,213,965 | 508 | 0.00% | 891,607,000 | 308,871 | 0.03% |
| Trade | 9,438,679 | 1,327 | 0.01% | 1,009,713,000 | 172,076 | 0.02% |
| Transportation & Warehousing | 2,826,797 | 419 | 0.01% | 295,408,000 | 110,426 | 0.04% |
| Information | 2,358,672 | 411 | 0.02% | 294,252,000 | 40,145 | 0.01% |
| Finance & Insurance | 4,510,213 | 758 | 0.02% | 647,655,000 | 131,448 | 0.02% |
| Real estate & rental | 976,644 | 245 | 0.03% | 148,119,000 | 31,172 | 0.02% |
| Professional Services & Management of Companies | 6,796,877 | 3,061 | 0.05% | 1,110,322,000 | 343,272 | 0.03% |
| Administrative & Waste Services (private only) | 3,164,252 | 608 | 0.02% | 353,648,000 | 71,111 | 0.02% |
| Educational Services (private only) | 677,054 | 60 | 0.01% | 146,724,000 | 18,000 | 0.01% |
| Health & Social Services (private only) | 8,892,311 | 796 | 0.01% | 1,000,258,000 | 141,050 | 0.01% |
| Arts, Entertainment & Recreation Services | 338,006 | 40 | 0.01% | 100,953,000 | 13,551 | 0.01% |
| Accommodations & Food Services | 2,113,273 | 3,350 | 0.16% | 278,844,000 | 103,320 | 0.04% |
| Other Services | 2,992,088 | 724 | 0.02% | 330,361,000 | 62,097 | 0.02% |
| Government & Government Enterprises | 16,849,447 | 257 | 0.00% | 1,642,674,000 | 29,876 | 0.00% |
| Total | 81,542,890 | 14,002 | 0.02% | 8,986,229,000 | 2,053,778 | 0.02% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
[c] Includes all labor earnings regardless of location within U.S.
Note: Values less than 0.01 percent are expressed as 0.00 percent.

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a] Designation Name / Facility Location[b] | Health Professional Shortage Areas (HPSA)[a] Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/ Populations (MUA/P)[d] Designation Name |
|---|---|---|---|---|---|---|---|
| **Montana** | | | | | | | |
| Phillips | 1 | 1 | 1 | 0 | Phillips<br>Eastern Montana | Single County (P, D)<br>Geographical Area (M) | Phillips Service Area |
| Valley | 5 | 3 | 2 | 0 | Low-Income – Valley<br>Eastern Montana | Population Group (P)<br>Geographical Area (M) | Valley Service Area |
| McCone | 2 | 0 | 1 | 0 | McCone<br>Low-Income – Glendive<br>Eastern Montana | Single County (P)<br>Population Group (D)<br>Geographical Area (M) | McCone County |
| Dawson | 2 | 0 | 1 | 0 | Low-Income – Glendive<br>Eastern Montana | Population Group (D)<br>Geographical Area (M) | NA |
| Prairie | 1 | 0 | 1 | 0 | Prairie<br>Low-Income – Miles City<br>Low-Income – Glendive<br>Eastern Montana | Single County (P)<br>Population Group (D)<br>Population Group (D)<br>Geographic Area (M) | Miles City Service Area |
| Fallon | 3 | 1 | 1 | 0 | Low-Income – Fallon<br>Fallon/Ekalaka<br>Eastern Montana | Population Group (P)<br>Geographical Area (D)<br>Geographical Area (M) | Baker Service Area |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a] Designation Name / Facility Location[b] | Health Professional Shortage Areas (HPSA)[a] Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/ Populations (MUA/P)[d] Designation Name |
|---|---|---|---|---|---|---|---|
| Carter | 2 | 0 | 1 | 0 | Low-Income – Fallon<br>Low-Income – Miles City<br><br>Fallon/Ekalaka<br>Eastern Montana | Population Group (P)<br>Population Group (D)<br>Geographical Area (D)<br><br>Geographical Area (M) | Baker Service Area |
| *Subtotal Montana* | *16* | *5* | *8* | *0* | | | |
| **South Dakota** | | | | | | | |
| Harding | 1 | 0 | 1 | 0 | Harding | Single County (P,D,M) | Harding Service Area |
| Butte | 1 | 1 | 1 | 1 | Newell<br>Butte | Geographical Area (P)<br>Single County (M) | Butte Service Area |
| Perkins | 1 | 1 | 1 | 1 | Faith<br>Lemmon (SD/ND)<br>Perkins<br>Catchment Area 8 | Geographical Area (P)<br><br>Single County (D)<br>Geographical Area (M) | Perkins County |
| Meade | 2 | 0 | 1 | 0 | Faith<br>Lawrence and Meade Counties | Geographical Area (P,D)<br>Geographical Area (M) | Bellefourche-Cheyennevunorg Service Area |
| Ziebach | 1 | 1 | 1 | 1 | Ziebach<br>Catchment Area 8 | Single County (P,D,M)<br>Geographical Area (M) | Ziebach Service Area |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a] Designation Name / Facility Location[b] | Health Professional Shortage Areas (HPSA)[a] Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/ Populations (MUA/P)[d] Designation Name |
|---|---|---|---|---|---|---|---|
| Pennington | 1 | 1 | 1 | 0 | Community Health Center of Black Hill<br>Rapid City HS Indian Health Hospital<br>Wall Service Area | Comprehensive Health Center (P,D,M)<br>Indian Health Service Facility (P,D,M)<br>Geographical Area (P) | New Underwood Service Area<br>Pennington Service Area |
| Haakon | 1 | 0 | 1 | 0 | Phillip Clinic<br>Low-Income – Haakon County<br>Catchment Area 2 | Rural Health Clinic (P,D,M)<br>Population Group (P)<br>Geographical Area (M) | Unorg. Terr. of West Haakon County |
| Jones | 1 | 0 | 1 | 0 | Jones<br>Catchment Area 2 | Single County (P,D)<br>Geographical Area (M) | Jones Service Area |
| Lyman | 1 | 0 | 1 | 0 | Lyman<br>Lower Brule Sioux Tribe<br>Catchment Area 2 | Single County (P,D)<br>Native American Tribal Population (P,D,M)<br>Geographical Area (M) | Lyman Service Area |
| Tripp | 5 | 4 | 2 | 1 | Low-Income – Tripp County<br>Tripp<br>Catchment Area 10 | Population Group (P)<br>Single County (D)<br>Geographical Area (M) | Tripp Service Area |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a] Designation Name / Facility Location[b] | Health Professional Shortage Areas (HPSA)[a] Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/ Populations (MUA/P)[d] Designation Name |
|---|---|---|---|---|---|---|---|
| Gregory | 1 | 1 | 1 | 0 | Fairfax Service Area<br>Bonesteel Medical Clinic<br>Burke Medical Clinic<br>Low-Income – Gregory County<br>Catchment Area 10 | Geographical Area (P)<br>Rural Health Clinic (P)<br>Rural Health Clinic (P)<br>Population Group (D)<br>Geographical Area (M) | Gregory Service Area |
| *Subtotal South Dakota* | *16* | *9* | *12* | *4* | | | |
| **Nebraska** | | | | | | | |
| Keya Paha | 1 | 0 | 1 | 1 | Keya Paha<br>Catchment Area 4 | Single County (P)<br>Geographical Area (M) | Keya Paha Service Area |
| Boyd | 1 | 0 | 1 | 0 | Catchment Area 4 | Geographical Area (M) | Boyd Service Area |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a]: Designation Name / Facility Location[b] | Health Professional Shortage Areas (HPSA)[a]: Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/ Populations (MUA/P)[d]: Designation Name |
|---|---|---|---|---|---|---|---|
| Holt | 5 | 0 | 4 | 0 | West Holt Medical Center | Rural Health Clinic (P,D) | Holt Service Area |
| | | | | | Greater Sandhills Family Healthcare | Rural Health Clinic (P,D) | |
| | | | | | Greater Sandhills Family Healthcare – Stuart | Rural Health Clinic (P,D) | |
| | | | | | Avera O'Neill Family Medicine | Rural Health Clinic (P,D) | |
| | | | | | Avera Holt County Medical Clinic | Rural Health Clinic (P,D) | |
| | | | | | Catchment Area 4 | Geographical Area (M) | |
| Antelope | 4 | 0 | 2 | 0 | Catchment Area 4 | Geographical Area (M) | Antelope Service Area |
| Boone | 3 | 0 | 1 | 0 | Boone County Medical Clinic | Rural Health Clinic (P) | Boone Service Area |
| | | | | | Catchment Area 4 | Geographical Area (M) | |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a] | | Medically Underserved Areas/ Populations (MUA/P)[d] |
|---|---|---|---|---|---|---|---|
| | | | | | Designation Name / Facility Location[b] | Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health) | Designation Name |
| Nance | 2 | 0 | 1 | 0 | Nance<br>Nance County Medical Clinic<br>Park Street Medical Clinic<br>Lone Tree Medical Associates - Fullerton<br><br>Catchment Area 4 | Single County (P)<br>Rural Health Clinic (P)<br><br>Rural Health Clinic (P,D,M)<br>Rural Health Clinic (P,D,M)<br>Geographical Area (M) | Genoa Service Area |
| Merrick | 2 | 0 | 1 | 0 | Lone Tree Medical Associates, P.C.<br>Mental Health Catchment Area 3 | Rural Health Clinic (P,D,M)<br>Geographical Area (M) | Clarksville Service Area<br>Loup Service Area |
| Polk | 2 | 0 | 2 | 0 | Mental Health Catchment Area 5 | Geographical Area (M) | Polk Service Area |
| York | 3 | 1 | 3 | 0 | Mental Health Catchment Area 5 | Geographical Area (M) | NA |
| Fillmore | 2 | 0 | 1 | 0 | Fillmore County Medical Center, P.C.<br>Mental Health Catchment Area 5 | Rural Health Clinic (P,D)<br><br>Geographical Area (M) | Fillmore Service Area |
| Saline | 2 | 0 | 1 | 0 | Mental Health Catchment Area 5 | Geographical Area (M) | Saline Service Area |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[a] | | Medically Underserved Areas/ Populations (MUA/P)[d] |
|---|---|---|---|---|---|---|---|
| | | | | | **Designation Name / Facility Location[b]** | **Geographic Area or Facility Type[c] (P= Primary Medical Care; D= Dental; M = Mental Health)** | **Designation Name** |
| Jefferson | 3 | 0 | 1 | 0 | Medicaid Eligible – Jefferson County<br>Mental Health Catchment Area 5 | Population Group (D)<br>Geographical Area (M) | Fairbury City – County |
| *Subtotal Nebraska* | *30* | *1* | *19* | *1* | | | |
| **Kansas** | | | | | | | |
| Clay | 4 | 0 | 2 | 0 | Clay Center Family Physicians<br>Low-Income – Clay County<br>Mental Health Area 14 | Rural Health Clinic (P,D,M)<br>Population Group (P,D)<br>Geographical Area (M) | Low-Income – Clay County |
| Butler | 2 | 1 | 2 | 0 | El Dorado Clinic<br>August Family Practice<br>El Dorado Correctional Facility<br>Mental Health Catchment Area 17 – Butler County | Rural Health Clinic (P)<br>Rural Health Clinic (P,D,M)<br>Correctional Facility (P,D,M)<br>Geographical Area (M) | Butler Service Area |
| *Subtotal Kansas* | *6* | *1* | *4* | *0* | | | |

## Table 12 Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within the Socioeconomic Analysis Area

Source: Health Resources and Services Administration (HRSA) 2012.

Note: Any differences between this table and the Final EIS (August 26, 2011) are due to changes in HPSA and MUA/P over time.

[a] Health Professional Shortage Areas (HPSAs) are designated by HRSA as having shortages of primary medical care, dental or mental health providers and may be geographic (a county or service area), demographic (low income population) or institutional (comprehensive health center, federally qualified health center or other. public facility).
[b] Satellite sites of Comprehensive Health Centers automatically assume the HPSA score of the affiliated grantee. They are not listed separately.
[c] Geographic Single County is defined as a whole county designated as HPSA; Geographic Service Areas are portions of a county, or portions of multiple counties, designated as a geographic HPSA; Population Groups are defined as a population within an area that is designated as a HPSA; Correctional Institutions are federal and state prisons and youth detention facilities; Rural Health Clinics are certified as Rural Health Clinics by the Centers for Medicare and Medicaid Services; Indian Health Service sites serve Federally Recognized tribes.
[d] Medically Underserved Areas/Populations are areas or populations designated by HRSA as having: too few primary care providers, high infant mortality, high poverty, and/or high elderly population.

## Memo 13 Electrical Cost Estimate

# Memo to File

**From:** Bryn Pittinger, ERM; Clive Graham, ERM

**Subject:** Keystone Pipeline – Electrical Cost Estimate

**Date:** October 15, 2012

The purpose of this memo is to document estimated costs for installing electrical lines and substations needed for the Keystone Pipeline. These costs will be used in the economic modeling to estimate the Project's employment and economic effects.

## Electrical Lines

*Cost Estimate*

The construction costs for installing electrical lines are presented by electrical rating in the table below. Environmental[1], engineering, and right-of-way acquisition costs are not included. Electrical lines are associated with pump stations in each state and with the Big Bend/Witten connected action. The Nebraska electrical line and Bakken Marketlink connected action information will be added once additional data is received.

| | 69-kV @ $0.3MM/mi | | 115-kV @ $0.6MM/mi | | 230-kV @ $1.5MM/mi | | Total |
|---|---|---|---|---|---|---|---|
| | **Length (miles)** | **Cost ($MM)** | **Length (miles)** | **Cost ($MM)** | **Length (miles)** | **Cost ($MM)** | **Cost ($MM)** |
| **Project** | | | | | | | |
| Montana | 0.0 | $0.0 | 135.6 | $81.4 | 0.2 | $0.3 | $81.7 |
| South Dakota | 0.0 | $0.0 | 159.1 | $95.5 | 0.0 | $0.0 | $95.5 |
| Nebraska – North | TBD | TBD | TBD | TBD | TBD | TBD | TBD |
| Nebraska – Central/South | TBD | TBD | TBD | TBD | TBD | TBD | TBD |
| Kansas | 0.0 | $0.0 | 13.5 | $8.1 | 0.0 | $0.0 | $8.1 |
| **Connected Actions** | | | | | | | |
| Big Bend/Witten | 0.0 | $0.0 | 0.0 | $0.0 | 72.1 | $108.2 | $108.2 |
| Bakken Marketlink | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

kV = kilovolts, MM = million, mi = mile, TBD = to be determined,

[1] This term is understood to include all environmental costs associated with the construction including, but not limited to, EIS, permitting, erosion controls, and post-construction restoration.

## Memo 13 Electrical Cost Estimate

*Methodology*

Cost estimates from various internet sources in the table below were estimated and rounded to obtain the construction costs per mile.

| Source | 69-kV Cost ($1,000/mi) | 115-kV Cost ($1,000/mi) | 230-kV Cost ($1,000/mi) |
|---|---|---|---|
| Lincoln Electric System | N/A | $550 | N/A |
| National Council on Electricity Policy | $285 | $390 | N/A |
| Otter Tail Power Company | N/A | $400 | N/A |
| Pacific Gas and Electric | N/A | $990 | $1,425 |
| PJM | N/A | N/A | $2,000 |
| Public Service Commission of WI | $285 | N/A | N/A |
| Western Electricity Coordinating Council | N/A | N/A | $1,500 |
| Rounded Average | $300 | $600 | $1,500 |

kV = kilovolts, mi = mile, N/A = not applicable

## Substations

*Cost Estimate*

The construction costs for installing substations are presented by electrical rating in the table below. Environmental[1], engineering, land acquisition costs are not included. Substations are associated with pump stations in each state and with the Big Bend/Witten connected action. A transformer is included as part of the estimate for each substation[2]. The Nebraska electrical line and Bakken Marketlink connected action information will be added once additional data is received.

[2] The Final EIS (August 26, 2011) specifies that the pump stations will have 20/27/33-MVA transformers. Until additional information is provided, connected action substations are assumed to include standard-sized transformers for transmission lines (e.g. 200-MVA).

## Memo 13 Electrical Cost Estimate

| | 69-kV @ $6MM/substation | | 115-kV @ $6MM/substation | | 230-kV @ $11MM/substation | | Total |
|---|---|---|---|---|---|---|---|
| | Quantity | Cost ($MM) | Quantity | Cost ($MM) | Quantity | Cost ($MM) | Cost ($MM) |
| **Project** | | | | | | | |
| Montana | 0 | $0.0 | 5 | $30.0 | 1 | $11.0 | **$41.0** |
| South Dakota | 0 | $0.0 | 7 | $42.0 | 0 | $0.0 | **$42.0** |
| Nebraska – North | TBD | TBD | TBD | TBD | TBD | TBD | **TBD** |
| Nebraska – Central/South | TBD | TBD | TBD | TBD | TBD | TBD | **TBD** |
| Kansas | 0 | $0.0 | 2 | $12.0 | 0 | $0.0 | **$12.0** |
| **Connected Actions** | | | | | | | |
| Big Bend/Witten | 0 | $0.0 | 0 | $0.0 | 2 | $22.0 | **$22.0** |
| Bakken Marketlink | TBD | TBD | TBD | TBD | TBD | TBD | **TBD** |

kV = kilovolts, MM = million, TBD = to be determined

*Methodology*

The table below contains cost estimates from various internet sources that were averaged and rounded to obtain the construction costs for each substation type. Cost estimates for a 69-kV substation could not be found, so it was treated as a 115-kV substation.

| Source | 115-kV Cost ($MM/substation) | 230-kV Cost ($MM/substation) |
|---|---|---|
| Enmax Corp. | $5.5 | N/A |
| Pacific Gas and Electric | $9.0 | $11.0 |
| Pacific Northwest National Laboratory | $3.0 | $12.0 |
| Western Area Power Administration | $5.0 | N/A |
| Western Electricity Coordinating Council | N/A | $8.2 |
| **Rounded Average** | **$6.0** | **$11.0** |

kV = kilovolts, MM = million, N/A = not applicable

**Memo 13 Electrical Cost Estimate**

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Unsuccessful Sources:

- Basin Electric Power Cooperative
- Border States Electric
- Electric Power Research Institute (EPRI)
- Energy Information Administration
- Energy Central
- Exeter Associates, Inc.
- Nebraska Public Power District
- Nebraska Public Services Commission
- Platts
- South Dakota Public Utilities Commission
- Utility Data Institute (UDI)

**Table 14 Total Employment by Industry Supported by Construction of the Bakken MarketLink, Montana (average annual jobs)**

| | Montana[a] | | |
|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | |
| Industry | Jobs[b] | Jobs[b] | Share of 2010 |
| Farm | 28,817 | 0 | 0.00% |
| Forestry, Fisheries & Support, including Farm Support | 6,796 | 1 | 0.01% |
| Mining | 10,367 | 1 | 0.01% |
| Utilities | 3,169 | 1 | 0.02% |
| Construction** | 41,684 | 35 | 0.08% |
| Manufacturing | 20,470 | 5 | 0.03% |
| Trade | 88,794 | 30 | 0.03% |
| Transportation & Warehousing | 17,651 | 5 | 0.03% |
| Information | 9,019 | 3 | 0.04% |
| Finance & Insurance | 26,207 | 11 | 0.04% |
| Real estate & rental | 29,121 | 20 | 0.07% |
| Professional Services & Management of Companies | 35,442 | 49 | 0.14% |
| Administrative & Waste Services (private only) | 27,061 | 11 | 0.04% |
| Educational Services (private only) | 7,923 | 1 | 0.02% |
| Health & Social Services (private only) | 68,321 | 13 | 0.02% |
| Arts, Entertainment & Recreation Services | 18,508 | 4 | 0.02% |
| Accommodations & Food Services | 49,696 | 13 | 0.03% |
| Other Services | 37,417 | 15 | 0.04% |
| Government & Government Enterprises | 97,185 | 1 | 0.00% |
| Total | 623,648 | 220 | 0.04% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work.
Note: Values less than 0.01 percent are expressed as 0.00 percent.

## Table 15 Total Employment by Industry Supported by Construction of the Bakken MarketLink, United States (average annual jobs)

| | United States[b] | | |
|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | |
| Industry | Jobs[a] | Jobs[a] | Share of 2010 |
| Farm | 2,665,000 | 6 | 0.000% |
| Forestry, Fisheries & Support, including Farm Support | 835,800 | 3 | 0.000% |
| Mining | 1,185,500 | 5 | 0.000% |
| Utilities | 579,000 | 3 | 0.001% |
| Construction | 8,914,200 | 272 | 0.003% |
| Manufacturing | 12,206,900 | 96 | 0.001% |
| Trade | 23,808,200 | 104 | 0.000% |
| Transportation & Warehousing | 5,504,400 | 25 | 0.000% |
| Information | 3,210,700 | 15 | 0.000% |
| Finance & Insurance | 9,651,300 | 53 | 0.001% |
| Real estate & rental | 7,459,200 | 45 | 0.001% |
| Professional Services & Management of Companies | 13,765,700 | 138 | 0.001% |
| Administrative & Waste Services (private only) | 10,478,800 | 60 | 0.001% |
| Educational Services (private only) | 4,076,600 | 12 | 0.000% |
| Health & Social Services (private only) | 19,062,300 | 74 | 0.000% |
| Arts, Entertainment & Recreation Services | 3,777,100 | 17 | 0.000% |
| Accommodations & Food Services | 12,048,000 | 56 | 0.000% |
| Other Services | 9,858,700 | 46 | 0.000% |
| Government & Government Enterprises | 24,680,000 | 8 | 0.000% |
| Total | 173,767,400 | 1,038 | 0.001% |

[a] Includes full-time and part-time jobs by place of work.
[b] Includes all full-time and part-time jobs regardless of location within U.S.
Note: Values less than 0.001 percent are expressed as 0.000 percent.

**Table 16 Total Earnings by Industry Supported by Construction of the Bakken MarketLink, Montana (thousands of 2010 dollars)**

| | Montana[a] | | |
|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | |
| Industry | $1,000[b] | $1,000[b] | Share of 2010 |
| Farm | 584,113 | 7 | 0.00% |
| Forestry, Fisheries & Support, including Farm Support | 162,574 | 26 | 0.02% |
| Mining | 664,002 | 53 | 0.01% |
| Utilities | 354,376 | 96 | 0.03% |
| Construction | 1,711,999 | 2,168 | 0.13% |
| Manufacturing | 1,031,332 | 266 | 0.03% |
| Trade | 2,885,777 | 1,099 | 0.04% |
| Transportation & Warehousing | 913,007 | 984 | 0.11% |
| Information | 393,005 | 173 | 0.04% |
| Finance & Insurance | 1,068,898 | 515 | 0.05% |
| Real estate & rental | 363,157 | 360 | 0.10% |
| Professional Services & Management of Companies | 1,586,798 | 2,613 | 0.16% |
| Administrative & Waste Services (private only) | 696,111 | 299 | 0.04% |
| Educational Services (private only) | 144,888 | 32 | 0.02% |
| Health & Social Services (private only) | 3,163,291 | 681 | 0.02% |
| Arts, Entertainment & Recreation Services | 294,479 | 47 | 0.02% |
| Accommodations & Food Services | 929,225 | 219 | 0.02% |
| Other Services | 1,002,215 | 594 | 0.06% |
| Government & Government Enterprises | 5,441,042 | 105 | 0.00% |
| Total | 23,390,289 | 10,336 | 0.04% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
Note: Values less than 0.01 percent are expressed as 0.00 percent.

**Table 17 Total Earnings by Industry Supported by Construction of the Bakken MarketLink, United States (thousands of 2010 dollars)**

| | United States[b] | | |
|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | |
| Industry | $1,000[a] | $1,000[a] | Share of 2010 |
| Farm | 77,215,000 | 176 | 0.000% |
| Forestry, Fisheries & Support, including Farm Support | 22,548,000 | 96 | 0.000% |
| Mining | 83,081,000 | 520 | 0.001% |
| Utilities | 73,306,000 | 424 | 0.001% |
| Construction | 479,541,000 | 17,272 | 0.004% |
| Manufacturing | 891,607,000 | 7,678 | 0.001% |
| Trade | 1,009,713,000 | 4,467 | 0.000% |
| Transportation & Warehousing | 295,408,000 | 2,174 | 0.001% |
| Information | 294,252,000 | 1,257 | 0.000% |
| Finance & Insurance | 647,655,000 | 3,565 | 0.001% |
| Real estate & rental | 148,119,000 | 951 | 0.001% |
| Professional Services & Management of Companies | 1,110,322,000 | 9,871 | 0.001% |
| Administrative & Waste Services (private only) | 353,648,000 | 2,077 | 0.001% |
| Educational Services (private only) | 146,724,000 | 531 | 0.000% |
| Health & Social Services (private only) | 1,000,258,000 | 4,312 | 0.000% |
| Arts, Entertainment & Recreation Services | 100,953,000 | 389 | 0.000% |
| Accommodations & Food Services | 278,844,000 | 1,212 | 0.000% |
| Other Services | 330,361,000 | 1,798 | 0.001% |
| Government & Government Enterprises | 1,642,674,000 | 654 | 0.000% |
| Total | 8,986,229,000 | 59,425 | 0.001% |

[a] Labor earnings by place of work.
[b] Includes all labor earnings regardless of location within U.S.
Note: Values less than 0.001 percent are expressed as 0.000 percent.

## Table 18 Total Employment by Industry Supported by Construction of the Big Bend-Witten 230-kV Transmission Line, South Dakota and the United States (average annual jobs)

| | South Dakota[a] | | | United States[c] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| Industry | Jobs[b] | Jobs[b] | Share of 2010 | Jobs[b] | Jobs[b] | Share of 2010 |
| Farm | 31,776 | 0 | 0.0% | 2,665,000 | 4 | 0.000% |
| Forestry, Fisheries & Support, including Farm Support | 4,682 | 0 | 0.0% | 835,800 | 2 | 0.000% |
| Mining | 1,983 | 0 | 0.0% | 1,185,500 | 5 | 0.000% |
| Utilities | 2,180 | 1 | 0.1% | 579,000 | 2 | 0.000% |
| Construction | 32,217 | 471 | 0.6% | 8,914,200 | 475 | 0.005% |
| Manufacturing | 39,151 | 8 | 0.0% | 12,206,900 | 46 | 0.000% |
| Trade | 83,456 | 57 | 0.1% | 23,808,200 | 84 | 0.000% |
| Transportation & Warehousing | 15,003 | 9 | 0.1% | 5,504,400 | 20 | 0.000% |
| Information | 7,636 | 5 | 0.1% | 3,210,700 | 11 | 0.000% |
| Finance & Insurance | 37,772 | 31 | 0.1% | 9,651,300 | 49 | 0.001% |
| Real estate & rental | 17,989 | 19 | 0.1% | 7,459,200 | 35 | 0.000% |
| Professional Services & Management of Companies | 23,329 | 62 | 0.3% | 13,765,700 | 105 | 0.001% |
| Administrative & Waste Services (private only) | 18,942 | 13 | 0.1% | 10,478,800 | 44 | 0.000% |
| Educational Services (private only) | 10,283 | 4 | 0.0% | 4,076,600 | 8 | 0.000% |
| Health & Social Services (private only) | 64,695 | 37 | 0.1% | 19,062,300 | 56 | 0.000% |
| Arts, Entertainment & Recreation Services | 11,309 | 7 | 0.1% | 3,777,100 | 12 | 0.000% |
| Accommodations & Food Services | 40,406 | 28 | 0.1% | 12,048,000 | 46 | 0.000% |
| Other Services | 28,043 | 26 | 0.1% | 9,858,700 | 39 | 0.000% |
| Government & Government Enterprises | 85,615 | 6 | 0.0% | 24,680,000 | 9 | 0.000% |
| Total | 556,467 | 783 | 0.1% | 173,767,400 | 1,051 | 0.001% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work
[c] Includes all full-time and part-time jobs regardless of location within US.
Note: Values less than 0.001 percent are expressed as 0.000 percent.

**Table 19 Total Earnings by Industry Supported by Construction of the Big Bend-Witten 230-kV Transmission Line, South Dakota and the United States (thousands of 2010 dollars)**

| | South Dakota[a] | | | United States[c] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| **Industry** | $1,000[b] | $1,000[b] | Share of 2010 | $1,000[b] | $1,000[b] | Share of 2010 |
| Farm | 2,408,458 | 42 | 0.0% | 77,215,000 | 132 | 0.000% |
| Forestry, Fisheries & Support, including Farm Support | 121,559 | 7 | 0.0% | 22,548,000 | 78 | 0.000% |
| Mining | 54,975 | 13 | 0.0% | 83,081,000 | 453 | 0.001% |
| Utilities | 199,052 | 116 | 0.1% | 73,306,000 | 262 | 0.000% |
| Construction | 1,346,264 | 21,486 | 1.6% | 479,541,000 | 21,692 | 0.005% |
| Manufacturing | 1,990,690 | 455 | 0.0% | 891,607,000 | 3,107 | 0.000% |
| Trade | 2,813,605 | 1,806 | 0.1% | 1,009,713,000 | 2,962 | 0.000% |
| Transportation & Warehousing | 699,904 | 370 | 0.1% | 295,408,000 | 949 | 0.000% |
| Information | 345,770 | 204 | 0.1% | 294,252,000 | 701 | 0.000% |
| Finance & Insurance | 1,537,041 | 1,345 | 0.1% | 647,655,000 | 2,573 | 0.000% |
| Real estate & rental | 291,665 | 545 | 0.2% | 148,119,000 | 930 | 0.001% |
| Professional Services & Management of Companies | 1,227,650 | 3,130 | 0.3% | 1,110,322,000 | 6,508 | 0.001% |
| Administrative & Waste Services (private only) | 452,286 | 283 | 0.1% | 353,648,000 | 1,291 | 0.000% |
| Educational Services (private only) | 236,258 | 94 | 0.0% | 146,724,000 | 248 | 0.000% |
| Health & Social Services (private only) | 3,165,948 | 1,821 | 0.1% | 1,000,258,000 | 2,838 | 0.000% |
| Arts, Entertainment & Recreation Services | 249,821 | 116 | 0.0% | 100,953,000 | 257 | 0.000% |
| Accommodations & Food Services | 689,960 | 410 | 0.1% | 278,844,000 | 790 | 0.000% |
| Other Services | 804,951 | 748 | 0.1% | 330,361,000 | 1,238 | 0.000% |
| Government & Government Enterprises | 4,332,428 | 295 | 0.0% | 1,642,674,000 | 552 | 0.000% |
| Total | 22,968,285 | 33,287 | 0.1% | 8,986,229,000 | 47,563 | 0.001% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
[c] Includes all labor earnings regardless of location within U.S.
Note: Values less than 0.001 percent are expressed as 0.000 percent.

**Table 20 Total Employment by Industry Supported by Construction of Electrical Distribution Lines and Substations, Montana and South Dakota (average annual jobs)**

| | Montana[a] | | | South Dakota[a] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| **Industry** | **Jobs[b]** | **Jobs[b]** | **Share of 2010** | **Jobs[b]** | **Jobs[b]** | **Share of 2010** |
| Farm | 28,817 | 1 | 0.0% | 31,776 | 1 | 0.0% |
| Forestry, Fisheries & Support, including Farm Support | 6,796 | 1 | 0.0% | 4,682 | 0 | 0.0% |
| Mining | 10,367 | 1 | 0.0% | 1,983 | 0 | 0.0% |
| Utilities | 3,169 | 2 | 0.1% | 2,180 | 1 | 0.1% |
| Construction | 41,684 | 574 | 1.4% | 32,217 | 592 | 1.8% |
| Manufacturing | 20,470 | 13 | 0.1% | 39,151 | 11 | 0.0% |
| Trade | 88,794 | 76 | 0.1% | 83,456 | 73 | 0.1% |
| Transportation & Warehousing | 17,651 | 16 | 0.1% | 15,003 | 12 | 0.1% |
| Information | 9,019 | 8 | 0.1% | 7,636 | 6 | 0.1% |
| Finance & Insurance | 26,207 | 30 | 0.1% | 37,772 | 36 | 0.1% |
| Real estate & rental | 29,121 | 35 | 0.1% | 17,989 | 21 | 0.1% |
| Professional Services & Management of Companies | 35,442 | 111 | 0.3% | 23,329 | 67 | 0.3% |
| Administrative & Waste Services (private only) | 27,061 | 31 | 0.1% | 18,942 | 15 | 0.1% |
| Educational Services (private only) | 7,923 | 6 | 0.1% | 10,283 | 4 | 0.0% |
| Health & Social Services (private only) | 68,321 | 53 | 0.1% | 64,695 | 43 | 0.1% |
| Arts, Entertainment & Recreation Services | 18,508 | 13 | 0.1% | 11,309 | 8 | 0.1% |
| Accommodations & Food Services | 49,696 | 41 | 0.1% | 40,406 | 33 | 0.1% |
| Other Services | 37,417 | 38 | 0.1% | 28,043 | 34 | 0.1% |
| Government & Government Enterprises | 97,185 | 6 | 0.0% | 85,615 | 6 | 0.0% |
| Total | 623,648 | 1,053 | 0.2% | 556,467 | 963 | 0.2% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work.
Note: Values less than 0.1 percent are expressed as 0.0 percent.

**Table 21 Total Employment by Industry Supported by Construction of Electrical Distribution Lines and Substations, Kansas and the United States (average annual jobs)**

| Industry | Kansas[a] | | | United States[c] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| | Jobs[b] | Jobs[b] | Share of 2010 | Jobs[b] | Jobs[b] | Share of 2010 |
| Farm | 65,033 | 0 | 0.00% | 2,665,000 | 13 | 0.000% |
| Forestry, Fisheries & Support, including Farm Support | 8,792 | 0 | 0.00% | 835,800 | 8 | 0.001% |
| Mining | 32,021 | 0 | 0.00% | 1,185,500 | 19 | 0.002% |
| Utilities | 8,006 | 0 | 0.00% | 579,000 | 7 | 0.001% |
| Construction | 85,945 | 110 | 0.13% | 8,914,200 | 1,288 | 0.014% |
| Manufacturing | 166,804 | 4 | 0.00% | 12,206,900 | 164 | 0.001% |
| Trade | 244,410 | 17 | 0.01% | 23,808,200 | 252 | 0.001% |
| Transportation & Warehousing | 55,368 | 3 | 0.01% | 5,504,400 | 63 | 0.001% |
| Information | 33,237 | 1 | 0.00% | 3,210,700 | 34 | 0.001% |
| Finance & Insurance | 96,177 | 7 | 0.01% | 9,651,300 | 134 | 0.001% |
| Real estate & rental | 56,979 | 5 | 0.01% | 7,459,200 | 104 | 0.001% |
| Professional Services & Management of Companies | 109,768 | 15 | 0.01% | 13,765,700 | 322 | 0.002% |
| Administrative & Waste Services (private only) | 94,824 | 6 | 0.01% | 10,478,800 | 140 | 0.001% |
| Educational Services (private only) | 25,896 | 1 | 0.00% | 4,076,600 | 23 | 0.001% |
| Health & Social Services (private only) | 188,923 | 11 | 0.01% | 19,062,300 | 169 | 0.001% |
| Arts, Entertainment & Recreation Services | 27,441 | 2 | 0.01% | 3,777,100 | 40 | 0.001% |
| Accommodations & Food Services | 109,251 | 7 | 0.01% | 12,048,000 | 134 | 0.001% |
| Other Services | 93,614 | 7 | 0.01% | 9,858,700 | 121 | 0.001% |
| Government & Government Enterprises | 302,753 | 1 | 0.00% | 24,680,000 | 23 | 0.000% |
| Total | 1,805,242 | 199 | 0.01% | 173,767,400 | 3,059 | 0.002% |

[a] Excludes jobs held by non-residents of the state as part of a temporary construction workforce.
[b] Includes full-time and part-time jobs by place of work.
[c] Includes all full-time and part-time jobs regardless of location within U.S.
Note: Values less than 0.001 percent are expressed as 0.000 percent.

## Table 22 Total Earnings by Industry Supported by Construction of Electrical Distribution Lines and Substations, Montana and South Dakota (thousands of 2010 dollars)

| Industry | Montana[a] Current (2010) $1,000[b] | Montana[a] Total Effects of Proposed Project $1,000[b] | Montana[a] Total Effects of Proposed Project Share of 2010 | South Dakota[a] Current (2010) $1,000[b] | South Dakota[a] Total Effects of Proposed Project $1,000[b] | South Dakota[a] Total Effects of Proposed Project Share of 2010 |
|---|---|---|---|---|---|---|
| Farm | 584,113 | 14 | 0.0% | 2,408,458 | 50 | 0.0% |
| Forestry, Fisheries & Support, including Farm Support | 162,574 | 35 | 0.0% | 121,559 | 12 | 0.0% |
| Mining | 664,002 | 67 | 0.0% | 54,975 | 21 | 0.0% |
| Utilities | 354,376 | 215 | 0.1% | 199,052 | 144 | 0.1% |
| Construction | 1,711,999 | 24,858 | 1.5% | 1,346,264 | 25,963 | 1.9% |
| Manufacturing | 1,031,332 | 620 | 0.1% | 1,990,690 | 582 | 0.0% |
| Trade | 2,885,777 | 2,419 | 0.1% | 2,813,605 | 2,318 | 0.1% |
| Transportation & Warehousing | 913,007 | 680 | 0.1% | 699,904 | 508 | 0.1% |
| Information | 393,005 | 361 | 0.1% | 345,770 | 250 | 0.1% |
| Finance & Insurance | 1,068,898 | 1,309 | 0.1% | 1,537,041 | 1,572 | 0.1% |
| Real estate & rental | 363,157 | 816 | 0.2% | 291,665 | 559 | 0.2% |
| Professional Services & Management of Companies | 1,586,798 | 5,538 | 0.3% | 1,227,650 | 3,396 | 0.3% |
| Administrative & Waste Services (private only) | 696,111 | 742 | 0.1% | 452,286 | 334 | 0.1% |
| Educational Services (private only) | 144,888 | 118 | 0.1% | 236,258 | 110 | 0.0% |
| Health & Social Services (private only) | 3,163,291 | 2,441 | 0.1% | 3,165,948 | 2,147 | 0.1% |
| Arts, Entertainment & Recreation Services | 294,479 | 145 | 0.0% | 249,821 | 138 | 0.1% |
| Accommodations & Food Services | 929,225 | 638 | 0.1% | 689,960 | 477 | 0.1% |
| Other Services | 1,002,215 | 1,134 | 0.1% | 804,951 | 1,007 | 0.1% |
| Government & Government Enterprises | 5,441,042 | 384 | 0.0% | 4,332,428 | 323 | 0.0% |
| Total | 23,390,289 | 42,534 | 0.2% | 22,968,285 | 39,912 | 0.2% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
Note: Values less than 0.1 percent are expressed as 0.0 percent.

## Table 23 Total Earnings by Industry Supported by Construction of Electrical Distribution Lines and Substations, Kansas and the United States (thousands of 2010 dollars)

| | Kansas[a] | | | United States[c] | | |
|---|---|---|---|---|---|---|
| | Current (2010) | Total Effects of Proposed Project | | Current (2010) | Total Effects of Proposed Project | |
| Industry | $1,000[b] | $1,000[b] | Share of 2010 | $1,000[b] | $1,000[b] | Share of 2010 |
| Farm | 2,219,064 | 6 | 0.00% | 77,215,000 | 365 | 0.000% |
| Forestry, Fisheries & Support, including Farm Support | 317,548 | 1 | 0.00% | 22,548,000 | 268 | 0.001% |
| Mining | 785,580 | 13 | 0.00% | 83,081,000 | 1,682 | 0.002% |
| Utilities | 880,257 | 38 | 0.00% | 73,306,000 | 850 | 0.001% |
| Construction | 4,192,163 | 5,170 | 0.12% | 479,541,000 | 56,590 | 0.012% |
| Manufacturing | 11,213,965 | 213 | 0.00% | 891,607,000 | 10,895 | 0.001% |
| Trade | 9,438,679 | 560 | 0.01% | 1,009,713,000 | 9,128 | 0.001% |
| Transportation & Warehousing | 2,826,797 | 141 | 0.00% | 295,408,000 | 3,152 | 0.001% |
| Information | 2,358,672 | 94 | 0.00% | 294,252,000 | 2,208 | 0.001% |
| Finance & Insurance | 4,510,213 | 317 | 0.01% | 647,655,000 | 7,204 | 0.001% |
| Real estate & rental | 976,644 | 135 | 0.01% | 148,119,000 | 2,673 | 0.002% |
| Professional Services & Management of Companies | 6,796,877 | 937 | 0.01% | 1,110,322,000 | 20,082 | 0.002% |
| Administrative & Waste Services (private only) | 3,164,252 | 187 | 0.01% | 353,648,000 | 4,123 | 0.001% |
| Educational Services (private only) | 677,054 | 37 | 0.01% | 146,724,000 | 755 | 0.001% |
| Health & Social Services (private only) | 8,892,311 | 500 | 0.01% | 1,000,258,000 | 8,346 | 0.001% |
| Arts, Entertainment & Recreation Services | 338,006 | 20 | 0.01% | 100,953,000 | 750 | 0.001% |
| Accommodations & Food Services | 2,113,273 | 124 | 0.01% | 278,844,000 | 2,405 | 0.001% |
| Other Services | 2,992,088 | 260 | 0.01% | 330,361,000 | 3,971 | 0.001% |
| Government & Government Enterprises | 16,849,447 | 75 | 0.00% | 1,642,674,000 | 1,545 | 0.000% |
| Total | 81,542,890 | 8,827 | 0.01% | 8,986,229,000 | 136,992 | 0.002% |

[a] Excludes labor earnings by non-residents of the state as part of a temporary construction workforce.
[b] Labor earnings by place of work.
[c] Includes all labor earnings regardless of location within U.S.
Note: Values less than 0.001 percent are expressed as 0.000 percent.

## Table 24 Rail/Pipeline Option – Minority Data for All Geographic Areas

| Geographic Area | Total Population | African American | | Native American (U.S.)/Aboriginal (CA)[a] | | Asian/Pacific Islander[b] | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| **Canada** | **31,241,030** | **783,795** | **2.5** | **1,172,785** | **3.8** | **3,509,950** | **11.2** | **641,215** | **2.1** | **133,120** | **0.4** | **6,240,865** | **20.0** |
| **Saskatchewan** | **953,845** | **5,090** | **0.5** | **141,890** | **14.9** | **23,365** | **2.4** | **4,635** | **0.5** | **810** | **0.1** | **175,790** | **18.4** |
| Census Division 17 | 40,135 | 40 | 0.1 | 12,215 | 30.4 | 275 | 0.7 | 80 | 0.2 | 0 | 0.0 | 12,610 | 31.4 |
| Lloydminster | 26,745 | 70 | 0.3 | 2,215 | 8.3 | 420 | 1.6 | 110 | 0.4 | 0 | 0.0 | 2,815 | 10.5 |
| *Saskatchewan Exceedance Criteria* | | *0.6%* | | *17.9%* | | *2.9%* | | *0.6%* | | *0.1%* | | *22.1%* | |
| **North Dakota** | **672,591** | **7,690** | **1.1** | **36,591** | **5.4** | **7,229** | **1.1** | **3,509** | **0.5** | **11,853** | **1.8** | **66,872** | **9.9** |
| Williams | 22,398 | 63 | 0.3 | 899 | 4.0 | 84 | 0.4 | 69 | 0.3 | 644 | 2.9 | 1,759 | 7.9 |
| *North Dakota Exceedance Criteria* | | *1.3%* | | *6.5%* | | *1.3%* | | *0.6%* | | *2.2%* | | *11.9%* | |
| **Oklahoma** | **3,751,351** | **277,644** | **7.4** | **321,687** | **8.6** | **69,445** | **1.9** | **154,409** | **4.1** | **221,321** | **5.9** | **1,044,506** | **27.8** |
| Lincoln | 34,273 | 615 | 1.8 | 2,218 | 6.5 | 77 | 0.2 | 203 | 0.6 | 1,734 | 5.1 | 4,847 | 14.1 |
| Creek | 69,967 | 1,544 | 2.2 | 7,001 | 10.0 | 275 | 0.4 | 734 | 1.0 | 4,649 | 6.6 | 14,203 | 20.3 |
| *Oklahoma Exceedance Criteria* | | *8.9%* | | *10.3%* | | *2.3%* | | *4.9%* | | *7.1%* | | *33.4%* | |

Sources: U.S. Census Bureau, Race 2010 (U.S. Census Bureau 2012b); Visible Minority Population Characteristics, Aboriginal Population (Statistics Canada 2006).

Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
Any discrepancies in the aggregate population are due to rounding.
[a] Aboriginal peoples in the U.S. include American Indian and Alaska Native populations.
[b] Only Asian populations are given for Canada-Pacific Islanders are included in *Other*.

## Table 25 Rail/Pipeline Option – Hispanic and Latino Origin Data for All Geographic Areas

| Geographic Area | Total Population # | Hispanic or Latino # | % |
|---|---|---|---|
| **Canada** | **31,241,030** | **304,245** | **1.0%** |
| **Saskatchewan** | **953,845** | **2,520** | **0.3%** |
| Census Division 17 | 40,135 | 50 | 0.1% |
| Lloydminster | 26,745 | 80 | 0.3% |
| *Saskatchewan Exceedance Criteria* | | *0.4%* | |
| **North Dakota** | **672,591** | **13,467** | **2.0%** |
| Williams | 22,398 | 436 | 1.9% |
| *North Dakota Exceedance Criteria* | | *2.4%* | |
| **Oklahoma** | **3,751,351** | **332,007** | **8.9%** |
| Lincoln | 34,273 | 838 | 2.4% |
| Creek | 69,967 | 2,152 | 3.1% |
| *Oklahoma Exceedance Criteria* | | *10.7%* | |

Sources: Hispanic or Latino Origin by Race, U.S. Census Bureau 2010 (U.S. Census Bureau 2012c); Visible Minority Population Characteristics (Statistics Canada 2006).

Note: Any discrepancies in the aggregate population are due to rounding.
[a] Hispanic and Latino populations are not included in the aggregate minority count.

## Table 26 Rail/Pipeline Option – Low-Income Data for All Geographic Areas

| Geographic Area | Population for Whom Poverty Status is Determined | Aggregate (Total) of Low-Income Populations | |
|---|---|---|---|
| | # | # | % |
| **Canada** | **30,628,935** | **4,686,227[a]** | **15.3%** |
| **Saskatchewan** | **897,575** | **129,251[a]** | **14.4%** |
| Census Division 17 | 33,070 | 4,101[a] | 12.4% |
| Lloydminster | 26,635 | 2,263[a] | 8.5% |
| *Saskatchewan Exceedance Criteria* | | *17.3%* | |
| **North Dakota** | **636,048** | **78,405** | **12.3%** |
| Williams | 20,581 | 1,793 | 0.3% |
| *North Dakota Exceedance Criteria* | | *14.8%* | |
| **Oklahoma** | **3,559,437** | **577,247** | **16.2%** |
| Lincoln | 33,409 | 4,936 | 14.8% |
| Creek | 68,104 | 10,473 | 15.4% |
| *Oklahoma Exceedance Criteria* | | *19.4%* | |

Source: U.S. Census Bureau 2006-2010: Poverty Status in the Past 12 Months (U.S. Census Bureau 2012a); Income in 2005 (Statistics Canada 2006).

Note: Any discrepancies in the aggregate population are due to rounding.
[a] Values are interpolated from total population and low-income percentage.

## Table 27 Rail/Pipeline Option – Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations in Affected Counties

| County | Minority Population | Low-Income Population | Health Professional Shortage Areas (HPSA)[b]: Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b]: Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/Populations (MUA/P)[e]: Designation Name |
|---|---|---|---|---|---|
| **North Dakota** | | | | | |
| Williams | 1 | 0 | Tioga<br>Trenton Indian Service Unit<br>Low-Income – Williston<br>Northwest Human Services Center | Geographical Area (P)<br>Native American Tribal Population (P)<br>Population Group (P)<br>Other Facility (M) | Native American Population – Trenton Service Area |
| *Subtotal North Dakota* | *1* | *0* | | | |
| **Oklahoma** | | | | | |
| Lincoln | 0 | 0 | Black Hawk Health Center<br>Low-Income – Lincoln County | Native American Tribal Population (P, D, M)<br>Population Group (P) | Lincoln County |
| Creek | 0 | 0 | Sapulpa Health Center – Creek Nation<br>Low-Income – Creek County<br>Sapulpa Health Center<br>Low-Income – Catchment Area 13<br>Salpulpa Behavioral Health Cmhi Grant | Indian Health Service Facility (P)<br>Population Group (P)<br>Native American Tribal Population (D, M)<br>Population Group (M)<br>Native American Tribal Population (M)<br>Native American Tribal Population (M) | Northwest Creek Service Area |
| *Subtotal Oklahoma* | *0* | *0* | | | |

Source: HRSA 2012.

[a] Canada does not have designated HPSAs or MUA/Ps.

## Table 27 Rail/Pipeline Option – Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations in Affected Counties

[b] Health Professional Shortage Areas (HPSAs) are designated by HRSA as having shortages of primary medical care, dental or mental health providers and may be geographic (a county or service area), demographic (low income population) or institutional (comprehensive health center, federally qualified health center or other public facility).
[c] Satellite sites of Comprehensive Health Centers automatically assume the HPSA score of the affiliated grantee. They are not listed separately.
[d] Geographic Single County is defined as a whole county designated as HPSA; Geographic Service Areas are portions of a county, or portions of multiple counties, designated as a geographic HPSA; Population Groups are defined as a population within an area that is designated as a HPSA; Correctional Institutions are federal and state prisons and youth detention facilities; Rural Health Clinics are certified as Rural Health Clinics by the Centers for Medicare and Medicaid Services; Indian Health Service sites serve Federally Recognized tribes.
[e] Medically Underserved Areas/Populations are areas or populations designated by HRSA as having: too few primary care providers, high infant mortality, high poverty and/or high elderly population.

## Table 28 Rail/Pipeline Option – Public Services

| State / County (City)[a] | Police / Sheriff Departments[b] | Fire Departments[c] | Nearest Medical Facilities (City)[d] |
|---|---|---|---|
| North Dakota | | | |
| Williams (Epping) | 3 | 7 | Tioga Medical Center and Clinic (Ray)<br>Mercy Medical Center (Williston) |
| Oklahoma | | | |
| Creek (Stroud) | 10 | 12 | Stroud Regional Medical Center (Stroud) |
| Lincoln (Stroud) | 7 | 9 | Stroud Regional Medical Center (Stroud) |

[a] States, counties, and cities are listed geographically from north to south as proposed project crosses the area.
[b] Number of police and sheriff departments determined from local, regional, and national records pertaining to law enforcement agencies as listed on the website usacops.com (2012).
[c] Number of fire departments determined from community database of fire departments in the United States as listed on the website Firedepartmentdirectory.com (2012).
[d] Medical facility located at a distance no further than approximately 50 miles from Project Area.

## Table 29 Rail/Tanker Option – Minority Data for All Geographic Areas

| Geographic Area | Total Population | African American | | Native American (U.S)/Aboriginal (CA)[a] | | Asian/Pacific Islander[b] | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| **Canada** | **31,241,030** | **783,795** | **2.5** | **1,172,785** | **3.8** | **3,509,950** | **11.2** | **641,215** | **2.1** | **133,120** | **0.4** | **6,240,865** | **20.0** |
| **British Columbia** | **4,074,380** | **28,315** | **0.7** | **196,070** | **4.8** | **913,635** | **22.4** | **41,480** | **1.0** | **25,420** | **0.6** | **1,204,920** | **29.6** |
| Skeena-Queen Charlotte | 19,590 | 75 | 0.4 | 7,985 | 40.8 | 1,380 | 7.0 | 40 | 0.2 | 30 | 0.2 | 9,485 | 48.4 |
| Prince Rupert | 12,750 | 50 | 0.4 | 4,475 | 35.1 | 1,280 | 10.0 | 20 | 0.2 | 15 | 0.1 | 5,840 | 45.8 |
| *British Columbia Exceedance Criteria* | | *0.8%* | | *5.8%* | | *26.9%* | | *12.2%* | | *0.7%* | | *35.5%* | |
| **Saskatchewan** | **953,845** | **5,090** | **0.5** | **141,890** | **14.9** | **23,365** | **2.4** | **4,635** | **0.5** | **810** | **0.1** | **175,790** | **18.4** |
| Census Division 17 | 40,135 | 40 | 0.1 | 12,215 | 30.4 | 275 | 0.7 | 80 | 0.2 | 0 | 0.0 | 12,610 | 31.4 |
| Lloydminster | 26,745 | 70 | 0.3 | 2,215 | 8.3 | 420 | 1.6 | 110 | 0.4 | 0 | 0.0 | 2,815 | 10.5 |
| *Saskatchewan Exceedance Criteria* | | *0.6%* | | *17.9%* | | *2.9%* | | *0.6%* | | *0.1%* | | *22.1%* | |
| **North Dakota** | **672,591** | **7,690** | **1.1** | **36,591** | **5.4** | **7,229** | **1.1** | **3,509** | **0.5** | **11,853** | **1.8** | **66,872** | **9.9** |
| Williams | 22,398 | 63 | 0.3 | 899 | 4.0 | 84 | 0.4 | 69 | 0.3 | 644 | 2.9 | 1,759 | 7.9 |
| Epping | 100 | 0 | 0.0 | 11 | 0.1 | 5 | 0.1 | 0 | 0.0 | 3 | 0.0 | 19 | 0.2 |
| *North Dakota Exceedance Criteria* | | *1.3%* | | *6.5%* | | *1.3%* | | *0.6%* | | *2.2%* | | *11.9%* | |
| **Oklahoma** | **3,751,351** | **277,644** | **7.4** | **321,687** | **8.6** | **69,445** | **1.9** | **154,409** | **4.1** | **221,321** | **5.9** | **1,044,506** | **27.8** |
| Lincoln | 34,273 | 615 | 1.8 | 2,218 | 6.5 | 77 | 0.2 | 203 | 0.6 | 1,734 | 5.1 | 4,847 | 14.1 |
| Creek | 69,967 | 1,544 | 2.2 | 7,001 | 10.0 | 275 | 0.4 | 734 | 1.0 | 4,649 | 6.6 | 14,203 | 20.3 |
| *Oklahoma Exceedance Criteria* | | *8.9%* | | *10.3%* | | *2.3%* | | *4.9%* | | *7.1%* | | *33.4%* | |
| **Texas** | **25,145,561** | **2,979,598** | **11.8** | **170,972** | **0.7** | **986,252** | **3.9** | **2,628,186** | **10.5** | **679,001** | **2.7** | **7,444,009** | **29.6** |
| Jefferson | 252,273 | 85,291 | 33.8 | 1,381 | 0.5 | 8,713 | 3.5 | 20,353 | 8.1 | 4,961 | 2.0 | 120,699 | 47.8 |
| Port Arthur | 53,818 | 21,921 | 40.7 | 398 | 0.7 | 3,193 | 5.9 | 7,569 | 14.1 | 1,289 | 2.4 | 34,370 | 63.9 |
| Harris | 4,092,459 | 775,492 | 18.9 | 27,763 | 0.7 | 256,050 | 6.3 | 583,566 | 14.3 | 131,332 | 3.2 | 1,774,203 | 43.4 |
| Houston | 2,099,451 | 498,466 | 23.7 | 14,997 | 0.7 | 127,531 | 6.1 | 329,436 | 15.7 | 68,530 | 3.3 | 1,038,960 | 49.5 |
| *Texas Exceedance Criteria* | | *14.2%* | | *0.8%* | | *4.7%* | | *12.6%* | | *3.2%* | | *35.5%* | |

Sources: U.S. Census Bureau 20110: Race (U.S. Census Bureau 2012b); Visible Minority Population Characteristics, Aboriginal Population (Statistics Canada 2006).

## Table 29 Rail/Tanker Option – Minority Data for All Geographic Areas

Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
Values less than 0.1 percent are expressed as 0.0 percent.
Any discrepancies in the aggregate population are due to rounding.
[a] Aboriginal peoples in the U.S. include American Indian and Alaska Native populations.
[b] Only Asian populations are given for Canada-Pacific Islanders are included in *Other*.

## Table 30 Rail/Tanker Option – Hispanic and Latino Origin Data for All Geographic Areas

| Geographic Area | 2006 Total Population # | Hispanic or Latino # | Hispanic or Latino % |
|---|---|---|---|
| **Canada** | **31,241,030** | **304,245** | **1.0%** |
| **British Columbia** | **4,074,380** | **28,965** | **0.7%** |
| Skeena-Queen Charlotte | 19,590 | 10 | 0.1% |
| Prince Rupert | 12,750 | 10 | 0.1% |
| *British Columbia Exceedance Criteria* | | *0.8%* | |
| **Saskatchewan** | **953,845** | **2,520** | **0.3%** |
| Census Division 17 | 40,135 | 50 | 0.1% |
| Lloydminster | 26,745 | 80 | 0.3% |
| *Saskatchewan Exceedance Criteria* | | *0.4%* | |
| **North Dakota** | **672,591** | **13,467** | **2.0%** |
| Williams | 22,398 | 436 | 1.9% |
| Epping | 100 | 0 | 0.0% |
| *North Dakota Exceedance Criteria* | | *2.4%* | |
| **Oklahoma** | **3,751,351** | **332,007** | **8.9%** |
| Lincoln | 34,273 | 838 | 2.4% |
| Creek | 69,967 | 2,152 | 3.1% |
| *Oklahoma Exceedance Criteria* | | *10.7%* | |
| **Texas** | **25,145,561** | **9,460,921** | **37.6%** |
| Jefferson | 252,273 | 42,899 | 17.0% |
| Port Arthur | 53,818 | 15,917 | 29.6% |
| Harris | 4,092,459 | 1,671,540 | 40.8% |
| Houston | 2,099,451 | 919,668 | 43.8% |
| *Texas Exceedance Criteria* | | *45.1%* | |

Sources: U.S. Census Bureau 2010: Hispanic or Latino Origin by Race (U.S. Census Bureau 2012c); Visible Minority Population Characteristics (Statistics Canada 2006).

Note: Any discrepancies in the aggregate population are due to rounding.
[a] Hispanic and Latino populations are not included in the aggregate minority count.

## Table 31 Rail/Tanker Option – Low-Income Data for All Geographic Areas

| Geographic Area | Population for Whom Poverty Status is Determined | Aggregate (Total) of Low-Income Populations | |
|---|---|---|---|
| | # | # | % |
| **Canada** | **30,628,935** | **4,686,227[a]** | **15.3%** |
| **British Columbia** | **3,978,215** | **688,231[a]** | **17.3%** |
| Skeena-Queen Charlotte | 16,470 | 2,849[a] | 17.3% |
| Prince Rupert | 12,645 | 2,415[a] | 19.1% |
| *British Columbia Exceedance Criteria* | | *20.8%* | |
| **Saskatchewan** | **897,575** | **129,251[a]** | **14.4%** |
| Census Division 17 | 33,070 | 4,101[a] | 12.4% |
| Lloydminster | 26,635 | 2,263[a] | 8.5% |
| *Saskatchewan Exceedance Criteria* | | *17.3%* | |
| **North Dakota** | **636,048** | **78,405** | **12.3%** |
| Williams | 20,581 | 1,793 | 0.3% |
| Epping | 51 | 12 | 23.5% |
| *North Dakota Exceedance Criteria* | | *14.8%* | |
| **Oklahoma** | **3,559,437** | **577,247** | **16.2%** |
| Lincoln | 33,409 | 4,936 | 14.8% |
| Creek | 68,104 | 10,473 | 15.4% |
| *Oklahoma Exceedance Criteria* | | *19.4%* | |
| **Texas** | **23,707,679** | **3,972,054** | **16.8%** |
| Jefferson | 233,086 | 43,720 | 18.8% |
| Port Arthur | 53,188 | 12,773 | 24.0% |
| Harris | 3,908,129 | 655,742 | 16.8% |
| Houston | 2,038,184 | 428,044 | 21.0% |
| *Texas Exceedance Criteria* | | *20.2%* | |

Source: U.S. Census Bureau 2006-2010: Poverty Status in the Past 12 Months (U.S. Census Bureau 2012a); Income in 2005 (Statistics Canada 2006).

Note: Any discrepancies in the aggregate population are due to rounding.
[a] Values are interpolated from total population and low-income percentage.

**Table 32 Rail/Tanker Option – Designated HPSAs and MUA/Ps for Minority and Low-Income Populations in Affected Counties**

| County | Minority Population | Low-Income Population | Health Professional Shortage Areas (HPSA)[b] Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b] Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/Populations (MUA/P)[e] Designation Name |
|---|---|---|---|---|---|
| **North Dakota** | | | | | |
| Williams | 1 | 0 | Tioga<br>Trenton Indian Service Unit<br>Low-Income – Williston<br>Northwest Human Services Center | Geographical Area (P)<br>Native American Tribal Population (P)<br>Population Group (P)<br>Other Facility (M) | Native American Population – Trenton Service Area |
| *Subtotal North Dakota* | *1* | *0* | | | |
| **Oklahoma** | | | | | |
| Lincoln | 0 | 0 | Black Hawk Health Center<br>Low-Income – Lincoln County | Native American Tribal Population (P, D, M)<br>Population Group (P) | Lincoln County |
| Creek | 0 | 0 | Sapulpa Health Center – Creek Nation<br>Low-Income – Creek County<br>Sapulpa Health Center<br>Low-Income – Catchment Area 13<br>Salpulpa Behavioral Health<br>Cmhi Grant | Indian Health Service Facility (P)<br>Population Group (P)<br>Native American Tribal Population (D, M)<br>Population Group (M)<br>Native American Tribal Population (M)<br>Native American Tribal Population (M) | Northwest Creek Service Area |
| *Subtotal Oklahoma* | *0* | *0* | | | |

**Table 32 Rail/Tanker Option – Designated HPSAs and MUA/Ps for Minority and Low-Income Populations in Affected Counties**

| County | Minority Population | Low-Income Population | Health Professional Shortage Areas (HPSA)[b] Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b] Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/Populations (MUA/P)[e] Designation Name |
|---|---|---|---|---|---|
| **Texas** | | | | | |
| Jefferson | 4 | 1 | Gulf Coast Health Center<br><br>Federal Correctional Complex Beaumont | Comprehensive Health Center (P, D, M)<br>Correctional Facility (M) | Low-Income – Jefferson Service Area<br>Port Arthur/Jefferson Service Area<br>Low-Income – Inner City Beaumont |
| Harris | 5 | 1 | South Central Houston<br>Aldine<br>East Central Houston<br>North Central<br>Federal Detention Center – Houston<br>Harris County Hospital District<br><br>South Central Houston Health Center<br>Immigration and Customs Enforcement – Houston<br>Acres Home<br>El Centro De Corazon<br><br>Pasadena Health Center<br><br>Fourth Ward Clinic Dba Good Neighbor Hcc<br>Ripley | Geographical Area (P, D, M)<br>Geographical Area (P, D, M)<br>Geographical Area (P, D, M)<br>Geographical Area (P)<br>Correctional Facility (P, D, M)<br><br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Correctional Facility (P, D, M)<br><br>Geographical Area (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Geographical Area (P, M)<br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M)<br>Geographical Area (P, D)<br>Comprehensive Health Center (P, D, M)<br>Comprehensive Health Center (P, D, M) | Pov/Span-Speak/Immig Pop. – Southwest Houston<br>Harris Service Area<br>East Central Houston<br>Ripley Service Area<br>South Central Harris County<br>Casa De Amigos Service Area<br>Baytown Service Area<br>Galena Park/Jacinto City Service Area<br>Low-Income – Alief Service Area<br>Acres Home Service Area<br>Settegast Service Area<br>Independence Heights Service Area<br>Trinity Gardens Service Area<br>Aldine<br>North Central |

## Table 32 Rail/Tanker Option – Designated HPSAs and MUA/Ps for Minority and Low-Income Populations in Affected Counties

| County | Minority Population | Low-Income Population | Health Professional Shortage Areas (HPSA)[b]: Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b]: Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/Populations (MUA/P)[e]: Designation Name |
|---|---|---|---|---|---|
| | | | Health Care for the Homeless – Houston<br>Legacy Community Health Systems, Inc.<br>Houston Community Health Center<br><br>Spring Branch Community Health Center<br>Settegast<br>Asian Am. Health Coalition of Gtr Houston/Dba Hope C<br>Houston Area Community Services, Inc.<br>Motherland, Inc.<br><br>Shriners Hospital for Children – Houston<br>Galena Service Area<br>Third Ward Service Area | Comprehensive Health Center (P, D, M)<br>Other Facility (P)<br><br>Geographical Area (P)<br>Geographical Area (M) | South Service Area<br>Northeast Central Service Area<br>Central Harris<br>West Pasadena<br>Low-Income – Spring Branch<br>Southern Third Ward Service Area<br>North Forest Service Area<br>Low-Income – Northwest Harris<br>Governor's Low-Income – Southwest Harris |
| *Subtotal Texas* | *9* | *2* | | | |

Source: HRSA 2012.

[a] Canada does not have designated HPSAs or MUA/Ps.
[b] Health Professional Shortage Areas (HPSAs) are designated by HRSA as having shortages of primary medical care, dental or mental health providers and may be geographic (a county or service area), demographic (low income population) or institutional (comprehensive health center, federally qualified health center or other public facility).
[c] Satellite sites of Comprehensive Health Centers automatically assume the HPSA score of the affiliated grantee. They are not listed separately.
[d] Geographic Single County is defined as a whole county designated as HPSA; Geographic Service Areas are portions of a county, or portions of multiple counties, designated as a geographic HPSA; Population Groups are defined as a population within an area that is designated as a HPSA; Correctional Institutions are federal and state prisons and youth

**Table 32 Rail/Tanker Option – Designated HPSAs and MUA/Ps for Minority and Low-Income Populations in Affected Counties**

detention facilities; Rural Health Clinics are certified as Rural Health Clinics by the Centers for Medicare and Medicaid Services; Indian Health Service sites serve Federally Recognized tribes.

[e] Medically Underserved Areas/Populations are areas or populations designated by HRSA as having: too few primary care providers, high infant mortality, high poverty, and/or high elderly population.

## Table 33 2011 Steele City Alternative - Minority Data for All Geographic Areas[a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| **Nebraska** | **1,826,341** | **82,885** | **4.5%** | **18,427** | **1.0%** | **33,572** | **1.8%** | **79,109** | **4.3%** | **39,510** | **2.2%** | **253,503** | **13.9%** |
| Keya Paha | 824 | 0 | 0.0% | 1 | 0.1% | 1 | 0.1% | 2 | 0.2% | 3 | 0.4% | 7 | 0.8% |
| CT 9754 | 824 | 0 | 0.0% | 1 | 0.1% | 1 | 0.1% | 2 | 0.2% | 3 | 0.4% | 7 | 0.8% |
| BG 1 | 824 | 0 | 0.0% | 1 | 0.1% | 1 | 0.1% | 2 | 0.2% | 3 | 0.4% | 7 | 0.8% |
| Rock | 1,526 | 1 | 0.1% | 9 | 0.6% | 3 | 0.2% | 4 | 0.3% | 6 | 0.4% | 23 | 1.5% |
| CT 9746 | 1,526 | 1 | 0.1% | 9 | 0.6% | 3 | 0.2% | 4 | 0.3% | 6 | 0.4% | 23 | 1.5% |
| BG 1 | 717 | 1 | 0.1% | 2 | 0.3% | 1 | 0.1% | 0 | 0.0% | 5 | 0.7% | 9 | 1.3% |
| Holt | 10,435 | 16 | 0.2% | 29 | 0.3% | 26 | 0.2% | 182 | 1.7% | 50 | 0.5% | 303 | 2.9% |
| CT 9740 | 1,654 | 3 | 0.2% | 0 | 0.0% | 3 | 0.2% | 3 | 0.2% | 12 | 0.7% | 21 | 1.3% |
| BG 2 | 1,024 | 3 | 0.3% | 0 | 0.0% | 1 | 0.1% | 0 | 0.0% | 9 | 0.9% | 13 | 1.3% |
| CT 9741 | 2,564 | 0 | 0.0% | 4 | 0.2% | 5 | 0.2% | 7 | 0.3% | 5 | 0.2% | 21 | 0.8% |
| BG 2 | 706 | 0 | 0.0% | 0 | 0.0% | 1 | 0.1% | 6 | 0.8% | 3 | 0.4% | 10 | 1.4% |
| Garfield | 2,049 | 3 | 0.1% | 0 | 0.0% | 3 | 0.1% | 5 | 0.2% | 5 | 0.2% | 16 | 0.8% |
| CT 9732 | 2,049 | 3 | 0.1% | 0 | 0.0% | 3 | 0.1% | 5 | 0.2% | 5 | 0.2% | 16 | 0.8% |
| BG 1 | 807 | 0 | 0.0% | 0 | 0.0% | 3 | 0.4% | 4 | 0.5% | 2 | 0.2% | 9 | 1.1% |
| Wheeler | 818 | 0 | 0.0% | 1 | 0.1% | 4 | 0.5% | 2 | 0.2% | 7 | 0.9% | 14 | 1.7% |
| CT 9736 | 818 | 0 | 0.0% | 1 | 0.1% | 4 | 0.5% | 2 | 0.2% | 7 | 0.9% | 14 | 1.7% |
| BG 1 | 818 | 0 | 0.0% | 1 | 0.1% | 4 | 0.5% | 2 | 0.2% | 7 | 0.9% | 14 | 1.7% |
| Greeley | 2,538 | 16 | 0.6% | 5 | 0.2% | 2 | 0.1% | 24 | 0.9% | 13 | 0.5% | 60 | 2.4% |
| CT 9709 | 2,538 | 16 | 0.6% | 5 | 0.2% | 2 | 0.1% | 24 | 0.9% | 13 | 0.5% | 60 | 2.4% |
| BG 1 | 1,300 | 15 | 1.2% | 2 | 0.2% | 2 | 0.2% | 18 | 1.4% | 7 | 0.5% | 44 | 3.4% |
| BG 2 | 1,238 | 1 | 0.1% | 3 | 0.2% | 0 | 0.0% | 6 | 0.5% | 6 | 0.5% | 16 | 1.3% |
| Boone | 5,505 | 23 | 0.4% | 12 | 0.2% | 12 | 0.2% | 18 | 0.3% | 18 | 0.3% | 83 | 1.5% |
| CT 9601 | 3,626 | 19 | 0.5% | 4 | 0.1% | 7 | 0.2% | 14 | 0.4% | 12 | 0.3% | 56 | 1.5% |
| BG 3 | 621 | 2 | 0.3% | 1 | 0.2% | 3 | 0.5% | 0 | 0.0% | 3 | 0.5% | 9 | 1.4% |
| BG 4 | 607 | 7 | 1.2% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 3 | 0.5% | 10 | 1.6% |
| Nance | 3,735 | 8 | 0.2% | 10 | 0.3% | 2 | 0.1% | 19 | 0.5% | 37 | 1.0% | 76 | 2.0% |
| CT 9661 | 3,735 | 8 | 0.2% | 10 | 0.3% | 2 | 0.1% | 19 | 0.5% | 37 | 1.0% | 76 | 2.0% |
| BG 1 | 596 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 1 | 0.2% | 8 | 1.3% | 9 | 1.5% |

## Table 33 2011 Steele City Alternative - Minority Data for All Geographic Areas[a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| Merrick | 7,845 | 15 | 0.2% | 31 | 0.4% | 66 | 0.8% | 105 | 1.3% | 78 | 1.0% | 295 | 3.8% |
| CT 9666 | 1,947 | 1 | 0.1% | 2 | 0.1% | 5 | 0.3% | 18 | 0.9% | 12 | 0.6% | 38 | 2.0% |
| BG 1 | 804 | 0 | 0.0% | 0 | 0.0% | 1 | 0.1% | 7 | 0.9% | 1 | 0.1% | 9 | 1.1% |
| CT 9668 | 3,283 | 3 | 0.1% | 13 | 0.4% | 45 | 1.4% | 36 | 1.1% | 44 | 1.3% | 141 | 4.3% |
| BG 1 | 1,220 | 0 | 0.0% | 6 | 0.5% | 2 | 0.2% | 24 | 2.0% | 22 | 1.8% | 54 | 4.4% |
| Hamilton | 9,124 | 19 | 0.2% | 15 | 0.2% | 19 | 0.2% | 51 | 0.6% | 65 | 0.7% | 169 | 1.9% |
| CT 9691 | 1,934 | 0 | 0.0% | 2 | 0.1% | 9 | 0.5% | 4 | 0.2% | 16 | 0.8% | 31 | 1.6% |
| BG 2 | 941 | 0 | 0.0% | 2 | 0.2% | 0 | 0.0% | 2 | 0.2% | 5 | 0.5% | 9 | 1.0% |
| Polk | 5,406 | 6 | 0.1% | 11 | 0.2% | 8 | 0.1% | 35 | 0.6% | 54 | 1.0% | 114 | 2.1% |
| CT 9601 | 3,239 | 6 | 0.2% | 7 | 0.2% | 5 | 0.2% | 27 | 0.8% | 38 | 1.2% | 83 | 2.6% |
| BG 2 | 661 | 0 | 0.0% | 2 | 0.3% | 1 | 0.2% | 2 | 0.3% | 6 | 0.9% | 11 | 1.7% |
| York | 13,665 | 158 | 1.2% | 58 | 0.4% | 67 | 0.5% | 263 | 1.9% | 139 | 1.0% | 685 | 5.0% |
| CT 9696 | 2,711 | 10 | 0.4% | 8 | 0.3% | 1 | 0.0% | 19 | 0.7% | 23 | 0.8% | 61 | 2.3% |
| BG 2 | 1,233 | 2 | 0.2% | 6 | 0.5% | 1 | 0.1% | 16 | 1.3% | 12 | 1.0% | 37 | 3.0% |
| CT 9698 | 4,634 | 100 | 2.2% | 35 | 0.8% | 33 | 0.7% | 170 | 3.7% | 54 | 1.2% | 392 | 8.5% |
| BG 2 | 1,840 | 78 | 4.2% | 18 | 1.0% | 4 | 0.2% | 96 | 5.2% | 26 | 1.4% | 222 | 12.1% |
| CT 9699 | 2,436 | 8 | 0.3% | 7 | 0.3% | 5 | 0.2% | 18 | 0.7% | 9 | 0.4% | 47 | 1.9% |
| BG 1 | 1,351 | 5 | 0.4% | 4 | 0.3% | 3 | 0.2% | 10 | 0.7% | 2 | 0.1% | 24 | 1.8% |
| *Nebraska Exceedance Criteria* | | *5.4%* | | *1.2%* | | *2.2%* | | *5.2%* | | *2.6%* | | *16.7%* | |

Sources: Total population and minority populations for each race (Race, U.S. Census Bureau 2012b).

[a] Data is presented only for geographic areas along the 2011 Steele City Alternative route that differ from the proposed Project route.
Notes: CT = Census Tract, BG = Block Group.
Values less than 0.1 percent are expressed as 0.0 percent.

**Table 34 2011 Steele City Alternative - Hispanic and Latino Origin Data for All Geographic Areas [a]**

| Geographic Area | Total Population # | Hispanic or Latino[b] # | Hispanic or Latino[b] % |
|---|---|---|---|
| **Nebraska** | **1,826,341** | **167,405** | **9.2%** |
| Keya Paha | 824 | 4 | 0.5% |
| CT 9754 | 824 | 4 | 0.5% |
| BG 1 | 824 | 4 | 0.5% |
| Rock | 1,526 | 2 | 0.1% |
| CT 9746 | 1,526 | 2 | 0.1% |
| BG 1 | 717 | 2 | 0.3% |
| Holt | 10,435 | 305 | 2.9% |
| CT 9740 | 1,654 | 15 | 0.9% |
| BG 2 | 1,024 | 4 | 0.4% |
| CT 9741 | 2,564 | 12 | 0.5% |
| BG 2 | 706 | 8 | 1.1% |
| Garfield | 2,049 | 15 | 0.7% |
| CT 9732 | 2,049 | 15 | 0.7% |
| BG 1 | 807 | 4 | 0.5% |
| Wheeler | 818 | 6 | 0.7% |
| CT 9736 | 818 | 6 | 0.7% |
| BG 1 | 818 | 8 | 1.0% |
| Greeley | 2,538 | 51 | 2.0% |
| CT 9709 | 2,538 | 51 | 2.0% |
| BG 1 | 1,300 | 31 | 2.4% |
| BG 2 | 1,238 | 21 | 1.7% |
| Boone | 5,505 | 65 | 1.2% |
| CT 9601 | 3,626 | 35 | 1.0% |
| BG 3 | 621 | 2 | 0.3% |
| BG 4 | 607 | 4 | 0.7% |
| Nance | 3,735 | 65 | 1.7% |
| CT 9661 | 3,735 | 65 | 1.7% |
| BG 1 | 596 | 8 | 1.3% |
| Merrick | 7,845 | 271 | 3.5% |
| CT 9666 | 1,947 | 49 | 2.5% |
| BG 1 | 804 | 17 | 2.1% |
| CT 9668 | 3,283 | 104 | 3.2% |
| BG 1 | 1,220 | 63 | 5.2% |
| Hamilton | 9,124 | 181 | 2.0% |
| CT 9691 | 1,934 | 15 | 0.8% |
| BG 2 | 941 | 6 | 0.6% |
| Polk | 5,406 | 156 | 2.9% |
| CT 9601 | 3,239 | 137 | 4.2% |
| BG 2 | 661 | 19 | 2.9% |
| York | 13,665 | 555 | 4.1% |
| CT 9696 | 2,711 | 54 | 2.0% |
| BG 2 | 1,233 | 41 | 3.3% |
| CT 9698 | 4,634 | 292 | 6.3% |
| BG 2 | 1,840 | 147 | 8.0% |
| CT 9699 | 2,436 | 52 | 2.1% |
| BG 1 | 1,351 | 29 | 2.1% |
| *Nebraska Exceedance Criteria* | | *11.0%* | |

Source: Hispanic and Latino populations (Hispanic or Latino Origin by Race, U.S. Census Bureau 2012c).

**Table 34 2011 Steele City Alternative - Hispanic and Latino Origin Data for All Geographic Areas [a]**

[a] Data is presented only for geographic areas along the 2011 Steele City Alternative route that differ from the proposed Project route.
[b] Hispanic and Latino populations are not included in the aggregate minority count.
Notes: CT = Census Tract, BG = Block Group

**Table 35 2011 Steele City Alternative - Low-Income Data for All Geographic Areas [a]**

| Geographic Area | Population for Whom Poverty Status is Determined # | Aggregate (Total) of Low-Income Populations # | % |
|---|---|---|---|
| **Nebraska** | **1,744,704** | **206,227** | **11.8%** |
| Keya Paha | 740 | 168 | 22.7% |
| CT 9754 | 740 | 168 | 22.7% |
| Rock | 1,641 | 157 | 9.6% |
| CT 9746 | 1,641 | 157 | 9.6% |
| Holt | 10,186 | 794 | 7.8% |
| CT 9740 | 1,521 | 95 | 6.2% |
| CT 9741 | 2,803 | 213 | 7.6% |
| Garfield | 2,019 | 270 | 13.4% |
| CT 9732 | 2,019 | 270 | 13.4% |
| Wheeler | 751 | 96 | 12.8% |
| CT 9736 | 751 | 96 | 12.8% |
| Greeley | 2,413 | 296 | 12.3% |
| CT 9709 | 2,413 | 296 | 12.3% |
| Boone | 5,433 | 360 | 6.6% |
| CT 9601 | 3,482 | 248 | 7.1% |
| Nance | 3,531 | 346 | 9.8% |
| CT 9661 | 3,531 | 346 | 9.8% |
| Merrick | 7,760 | 832 | 10.7% |
| CT 9666 | 1,699 | 88 | 5.2% |
| CT 9668 | 3,423 | 425 | 12.4% |
| Hamilton | 9,142 | 817 | 8.9% |
| CT 9691 | 1,779 | 135 | 7.6% |
| Polk | 5,403 | 375 | 6.9% |
| CT 9601 | 3,281 | 231 | 7.0% |
| York | 12,699 | 890 | 7.0% |
| CT 9696 | 2,533 | 136 | 5.4% |
| CT 9698 | 3,919 | 377 | 9.6% |
| CT 9699 | 2,308 | 131 | 5.7% |
| *Nebraska Exceedance Criteria* | | *14.2%* | |

Source: U.S. Census Bureau 2006-2010 Poverty Status in the Past 12 Months (U.S. Census Bureau 2012a).

[a] Data is presented only for geographic areas along the 2011 Steele City Alternative route that differ from the proposed Project route.

Notes: CT = Census Tract

**Table 36 2011 Steele City Alternative – Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within Census Block Groups in Affected Counties [a]**

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[b]: Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b]: Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/ Populations (MUA/P)[e]: Designation Name |
|---|---|---|---|---|---|---|---|
| **Nebraska** | | | | | | | |
| Rock | 1 | 0 | 1 | 0 | Greater Sandhills Family Healthcare – Bass<br>Catchment Area 4 | Rural Health Clinic (P, D, M)<br>Geographical Area (M) | Rock Service Area |
| Garfield | 1 | 0 | 1 | 0 | Burwell Medical Clinic<br>Mental Health Catchment Area 3 | Rural Health Clinic (P, D, M)<br>Geographical Area (M) | Garfield Service Area |
| Wheeler | 1 | 0 | 1 | 0 | Mental Health Catchment Area 3 | Geographical Area (M) | Wheeler Service Area |
| Greeley | 2 | 0 | 1 | 0 | Mental Health Catchment Area 3 | Geographical Area (M) | Greeley Service Area |
| Hamilton | 1 | 0 | 1 | 0 | Mental Health Catchment Area 3 | Geographical Area (M) | NA |
| *Subtotal Nebraska* | *6* | *0* | *5* | *0* | | | |

Source: HRSA 2012.

[a] Data is presented only for geographic areas along the 2011 Steele City Alternative route that differ from the proposed Project route.
[b] Health Professional Shortage Areas (HPSAs) are designated by HRSA as having shortages of primary medical care, dental or mental health providers and may be geographic (a county or service area), demographic (low income population) or institutional (comprehensive health center, federally qualified health center or other public facility).
[c] Satellite sites of Comprehensive Health Centers automatically assume the HPSA score of the affiliated grantee. They are not listed separately.
[d] Geographic Single County is defined as a whole county designated as HPSA; Geographic Service Areas are portions of a county, or portions of multiple counties, designated as a geographic HPSA; Population Groups are defined as a population within an area that is designated as a HPSA; Correctional Institutions are Federal and State prisons and youth

**Table 36 2011 Steele City Alternative – Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within Census Block Groups in Affected Counties [a]**

detention facilities; Rural Health Clinics are certified as Rural Health Clinics by the Centers for Medicare and Medicaid Services; Indian Health Service sites serve Federally Recognized tribes.

[e] Medically Underserved Areas/Populations are areas or populations designated by HRSA as having: too few primary care providers, high infant mortality, high poverty and/or high elderly population.

## Table 37 2011 Steele City Alternative – Public Services

| State / County[a,b] | Police / Sheriff Departments[c] | Fire Departments[d] | Nearest Medical Facilities[e] |
|---|---|---|---|
| Nebraska | | | |
| Rock | 1 | 1 | Rock County Hospital (Rock) |
| Garfield | 2 | 1 | |
| Wheeler | 1 | 1 | |
| Greeley | 3 | 1 | Boone County Health Center (Boone) |
| Hamilton | 2 | 4 | Litzenberg Memorial County Hospital (Central City) |

[a] Data is presented only for geographic areas along the 2011 Steele City Alternative route that differ from the proposed Project route.
[b] States, counties, and cities are listed geographically from north to south as proposed project crosses the area.
[c] Number of Police and Sheriff Departments determined from local, regional, and national records pertaining to Law Enforcement Agencies as listed on the website usacops.com (2012).
[d] Number of Fire Departments determined from community database of fire departments in the United States as listed on the website Firedepartmentdirectory.com (2012).
[e] Medical facility located at a distance no further than approximately 50 miles from Project Area.

## Table 38 County Property Tax Comparison of Proposed Project and 2011 Steele City Alternative (in thousands of 2010 dollars)

| State/County | Proposed Project | 2011 Steele City Alternative |
|---|---|---|
| Montana Total | $6,135 | $6,080 |
| Phillips | $545 | $545 |
| Valley | $1,441 | $1,420 |
| McCone | $1,010 | $1,005 |
| Dawson | $811 | $805 |
| Prairie | $353 | $352 |
| Fallon | $1,975 | $1,953 |
| South Dakota Total | $16,680 | $16,634 |
| Harding | $3,492 | $3,483 |
| Butte | $167 | $167 |
| Perkins | $945 | $941 |
| Meade | $3,496 | $3,478 |
| Pennington | $97 | $80 |
| Haakon | $3,163 | $3,170 |
| Jones | $1,526 | $1,526 |
| Lyman | $532 | $537 |
| Tripp | $3,257 | $3,252 |
| Gregory | $5 | NA |
| Nebraska Total | $11,810 | $11,369 |
| Keya Paha | $436 | $495 |
| Boyd | $311 | NA |
| Rock | NA | $299 |
| Holt | $3,050 | $2,518 |
| Garfield | NA | $379 |
| Wheeler | NA | $841 |
| Greeley | NA | $889 |
| Antelope | $2,341 | NA |
| Boone | $943 | $111 |
| Nance | $969 | $618 |
| Merrick | $288 | $980 |
| Polk | $481 | NA |
| Hamilton | NA | $250 |
| York | $932 | $951 |
| Fillmore | $500 | $861 |
| Saline | $567 | $648 |
| Jefferson | $993 | $1,528 |

Note: NA indicates that the county does not contain Keystone facilities, so the county would not levy a property tax.
The estimates in the table roughly approximate the property tax amount that could be paid annually. However, the amount of property tax revenue paid in the first year or any subsequent year of operations will likely vary over time because of the many factors that determine how much a pipeline company must pay in local property taxes in any given year.

## Table 39 2011 Steele City Alternative – Property Tax Revenue in Situs Counties, 2010

| County | Total Property Value in County | Total Property Tax Revenue | Effective Property Tax Rate |
|---|---|---|---|
| Montana | | | |
| Phillips | $401,090,831 | $8,062,381 | 2.0% |
| Valley | 551,323,709 | 14,706,595 | 2.7% |
| McCone | 246,556,992 | 3,892,575 | 1.6% |
| Dawson | 467,623,239 | 13,204,292 | 2.8% |
| Prairie | 106,386,478 | 2,613,113 | 2.5% |
| Fallon | 436,070,972 | 7,123,109 | 1.6% |
| Total | $2,209,052,221 | $49,602,065 | 2.2% |
| South Dakota | | | |
| Harding | $215,566,625 | $2,731,191 | 1.3% |
| Butte | 595,452,581 | 9,498,634 | 1.6% |
| Perkins | 318,254,493 | 4,468,261 | 1.4% |
| Meade | 1,662,772,219 | 28,166,408 | 1.7% |
| Pennington | 7,649,711,805 | 133,409,959 | 1.7% |
| Haakon | 336,585,980 | 3,049,053 | 0.9% |
| Jones | 229,359,183 | 1,982,019 | 0.9% |
| Lyman | 409,288,275 | 4,240,216 | 1.0% |
| Tripp | 583,522,735 | 7,413,209 | 1.3% |
| Total | $12,000,513,896 | $194,958,950 | 1.6% |
| Nebraska | | | |
| Keya Paha | $245,812,674 | $3,170,822 | 1.3% |
| Holt | 325,973,182 | 5,033,082 | 1.5% |
| Rock | 1,631,618,747 | 25,510,470 | 1.6% |
| Garfield | 226,745,668 | 3,890,784 | 1.7% |
| Wheeler | 256,161,110 | 3,393,401 | 1.3% |
| Boone | 396,052,589 | 6,806,442 | 1.7% |
| Greeley | 1,037,271,278 | 16,562,417 | 1.6% |
| Nance | 511,150,656 | 9,021,512 | 1.8% |
| Merrick | 920,338,590 | 16,488,968 | 1.8% |
| Hamilton | 1,394,205,765 | 23,261,812 | 1.7% |
| York | 1,763,598,787 | 27,568,396 | 1.6% |
| Saline | 1,068,882,294 | 16,955,782 | 1.6% |
| Fillmore | 1,235,103,379 | 23,050,519 | 1.9% |
| Jefferson | 983,483,004 | 16,698,237 | 1.7% |
| Total | $11,996,397,723 | $197,412,644 | 1.6% |
| Kansas | | | |
| Butler | $3,906,384,545 | $88,195,610 | 2.3% |
| Clay | 436,830,884 | 10,846,974 | 2.5% |

## Table 40 I-90 Alternative - Minority Data for All Geographic Areas [a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| **South Dakota** | **814,180** | **10,207** | **1.3%** | **71,817** | **8.8%** | **8,004** | **1.0%** | **7,477** | **0.9%** | **17,283** | **2.1%** | **114,788** | **14.1%** |
| Jones | 1,006 | 1 | 0.1% | 20 | 2.0% | 4 | 0.4% | 0 | 0.0% | 19 | 1.9% | 44 | 4.4% |
| CT 916 | 1,006 | 1 | 0.1% | 20 | 2.0% | 4 | 0.4% | 0 | 0.0% | 19 | 1.9% | 44 | 4.4% |
| BG 1 | 1,006 | 1 | 0.1% | 20 | 2.0% | 4 | 0.4% | 0 | 0.0% | 19 | 1.9% | 44 | 4.4% |
| Lyman | 3,755 | 3 | 0.1% | 1,436 | 38.2% | 11 | 0.3% | 5 | 0.1% | 109 | 2.9% | 1,564 | 41.7% |
| CT 9726 | 2,275 | 2 | 0.1% | 109 | 4.8% | 7 | 0.3% | 5 | 0.2% | 53 | 2.3% | 176 | 7.7% |
| BG 1 | 915 | 0 | 0.0% | 22 | 2.4% | 0 | 0.0% | 1 | 0.1% | 18 | 2.0% | 41 | 4.5% |
| BG 2 | 549 | 0 | 0.0% | 22 | 4.0% | 1 | 0.2% | 0 | 0.0% | 12 | 2.2% | 35 | 6.4% |
| BG 3 | 811 | 2 | 0.2% | 65 | 8.0% | 6 | 0.7% | 4 | 0.5% | 23 | 2.8% | 100 | 12.3% |
| Brule | 5,255 | 12 | 0.2% | 445 | 8.5% | 10 | 0.2% | 14 | 0.3% | 128 | 2.4% | 609 | 11.6% |
| CT 9731 | 2,657 | 4 | 0.2% | 87 | 3.3% | 4 | 0.2% | 12 | 0.5% | 50 | 1.9% | 157 | 5.9% |
| BG 1 | 876 | 2 | 0.2% | 55 | 6.3% | 2 | 0.2% | 2 | 0.2% | 35 | 4.0% | 96 | 11.0% |
| BG 2 | 792 | 2 | 0.3% | 23 | 2.9% | 2 | 0.3% | 5 | 0.6% | 6 | 0.8% | 38 | 4.8% |
| BG 3 | 989 | 0 | 0.0% | 9 | 0.9% | 0 | 0.0% | 5 | 0.5% | 9 | 0.9% | 23 | 2.3% |
| CT 9732 | 2,598 | 8 | 0.3% | 358 | 13.8% | 6 | 0.2% | 2 | 0.1% | 78 | 3.0% | 452 | 17.4% |
| BG 1 | 756 | 1 | 0.1% | 130 | 17.2% | 1 | 0.1% | 0 | 0.0% | 34 | 4.5% | 166 | 22.0% |
| BG 2 | 1,253 | 5 | 0.4% | 148 | 11.8% | 4 | 0.3% | 1 | 0.1% | 28 | 2.2% | 186 | 14.8% |
| BG 3 | 589 | 2 | 0.3% | 80 | 13.6% | 1 | 0.2% | 1 | 0.2% | 16 | 2.7% | 100 | 17.0% |
| Aurora | 2,710 | 11 | 0.4% | 40 | 1.5% | 18 | 0.7% | 50 | 1.8% | 14 | 0.5% | 133 | 4.9% |
| CT 9736 | 2,710 | 11 | 0.4% | 40 | 1.5% | 18 | 0.7% | 50 | 1.8% | 14 | 0.5% | 133 | 4.9% |
| BG 1 | 472 | 0 | 0.0% | 4 | 0.8% | 3 | 0.6% | 9 | 1.9% | 6 | 1.3% | 22 | 4.7% |
| BG 2 | 908 | 6 | 0.7% | 35 | 3.9% | 0 | 0.0% | 41 | 4.5% | 4 | 0.4% | 86 | 9.5% |
| BG 3 | 684 | 1 | 0.1% | 0 | 0.0% | 5 | 0.7% | 0 | 0.0% | 0 | 0.0% | 6 | 0.9% |
| BG 4 | 646 | 4 | 0.6% | 1 | 0.2% | 10 | 1.5% | 0 | 0.0% | 4 | 0.6% | 19 | 2.9% |
| Davison | 19,504 | 82 | 0.4% | 490 | 2.5% | 106 | 0.5% | 100 | 0.5% | 305 | 1.6% | 1,083 | 5.6% |
| CT 9626 | 2,919 | 1 | 0.0% | 33 | 1.1% | 11 | 0.4% | 12 | 0.4% | 29 | 1.0% | 86 | 2.9% |
| BG 1 | 979 | 1 | 0.1% | 26 | 2.7% | 2 | 0.2% | 0 | 0.0% | 9 | 0.9% | 38 | 3.9% |
| BG 2 | 855 | 0 | 0.0% | 1 | 0.1% | 5 | 0.6% | 11 | 1.3% | 12 | 1.4% | 29 | 3.4% |
| BG 3 | 1,085 | 0 | 0.0% | 6 | 0.6% | 4 | 0.4% | 1 | 0.1% | 8 | 0.7% | 19 | 1.8% |
| CT 9627 | 5,467 | 21 | 0.4% | 82 | 1.5% | 37 | 0.7% | 12 | 0.2% | 75 | 1.4% | 227 | 4.2% |

## Table 40 I-90 Alternative - Minority Data for All Geographic Areas[a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| BG 1 | 1,631 | 7 | 0.4% | 19 | 1.2% | 11 | 0.7% | 2 | 0.1% | 37 | 2.3% | 76 | 4.7% |
| CT 9628 | 6,111 | 34 | 0.6% | 199 | 3.3% | 32 | 0.5% | 37 | 0.6% | 118 | 1.9% | 420 | 6.9% |
| BG 1 | 905 | 14 | 1.5% | 46 | 5.1% | 2 | 0.2% | 8 | 0.9% | 25 | 2.8% | 95 | 10.5% |
| BG 2 | 977 | 7 | 0.7% | 27 | 2.8% | 10 | 1.0% | 6 | 0.6% | 28 | 2.9% | 78 | 8.0% |
| BG 3 | 1,072 | 8 | 0.7% | 44 | 4.1% | 5 | 0.5% | 11 | 1.0% | 25 | 2.3% | 93 | 8.7% |
| BG 4 | 741 | 1 | 0.1% | 12 | 1.6% | 3 | 0.4% | 3 | 0.4% | 10 | 1.3% | 29 | 3.9% |
| BG 5 | 1,388 | 3 | 0.2% | 11 | 0.8% | 6 | 0.4% | 6 | 0.4% | 11 | 0.8% | 37 | 2.7% |
| BG 6 | 1,028 | 1 | 0.1% | 59 | 5.7% | 6 | 0.6% | 3 | 0.3% | 19 | 1.8% | 88 | 8.6% |
| CT 9629 | 5,007 | 26 | 0.5% | 176 | 3.5% | 26 | 0.5% | 39 | 0.8% | 83 | 1.7% | 350 | 7.0% |
| BG 1 | 1,123 | 3 | 0.3% | 43 | 3.8% | 8 | 0.7% | 2 | 0.2% | 13 | 1.2% | 69 | 6.1% |
| BG 2 | 1,038 | 5 | 0.5% | 5 | 0.5% | 13 | 1.3% | 7 | 0.7% | 4 | 0.4% | 34 | 3.3% |
| BG 3 | 1,002 | 3 | 0.3% | 52 | 5.2% | 0 | 0.0% | 0 | 0.0% | 26 | 2.6% | 81 | 8.1% |
| BG 4 | 924 | 13 | 1.4% | 32 | 3.5% | 1 | 0.1% | 20 | 2.2% | 13 | 1.4% | 79 | 8.5% |
| BG 5 | 920 | 2 | 0.2% | 44 | 4.8% | 4 | 0.4% | 10 | 1.1% | 27 | 2.9% | 87 | 9.5% |
| Hanson | 3,331 | 0 | 0.0% | 11 | 0.3% | 11 | 0.3% | 6 | 0.2% | 18 | 0.5% | 46 | 1.4% |
| CT 9641 | 3,331 | 0 | 0.0% | 11 | 0.3% | 11 | 0.3% | 6 | 0.2% | 18 | 0.5% | 46 | 1.4% |
| BG 1 | 911 | 0 | 0.0% | 1 | 0.1% | 3 | 0.3% | 0 | 0.0% | 10 | 1.1% | 14 | 1.5% |
| BG 2 | 1,242 | 0 | 0.0% | 10 | 0.8% | 8 | 0.6% | 4 | 0.3% | 7 | 0.6% | 29 | 2.3% |
| BG 3 | 1,178 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 2 | 0.2% | 1 | 0.1% | 3 | 0.3% |
| McCook | 5,618 | 8 | 0.1% | 23 | 0.4% | 11 | 0.2% | 31 | 0.6% | 38 | 0.7% | 111 | 2.0% |
| CT 9647 | 2,405 | 5 | 0.2% | 17 | 0.7% | 9 | 0.4% | 13 | 0.5% | 20 | 0.8% | 64 | 2.7% |
| BG 1 | 933 | 5 | 0.5% | 1 | 0.1% | 1 | 0.1% | 4 | 0.4% | 4 | 0.4% | 15 | 1.6% |
| BG 3 | 689 | 0 | 0.0% | 2 | 0.3% | 4 | 0.6% | 3 | 0.4% | 6 | 0.9% | 15 | 2.2% |
| Hutchinson | 7,343 | 28 | 0.4% | 49 | 0.7% | 12 | 0.2% | 36 | 0.5% | 67 | 0.9% | 192 | 2.6% |
| CT 9686 | 3,153 | 21 | 0.7% | 18 | 0.6% | 6 | 0.2% | 31 | 1.0% | 37 | 1.2% | 113 | 3.6% |
| BG 1 | 1,104 | 3 | 0.3% | 4 | 0.4% | 4 | 0.4% | 7 | 0.6% | 6 | 0.5% | 24 | 2.2% |
| BG 2 | 1,378 | 18 | 1.3% | 11 | 0.8% | 2 | 0.1% | 24 | 1.7% | 26 | 1.9% | 81 | 5.9% |
| Yankton | 22,438 | 340 | 1.5% | 572 | 2.5% | 123 | 0.5% | 252 | 1.1% | 322 | 1.4% | 1,609 | 7.2% |
| CT 9661 | 3,038 | 26 | 0.9% | 101 | 3.3% | 19 | 0.6% | 68 | 2.2% | 59 | 1.9% | 273 | 9.0% |
| BG 1 | 618 | 5 | 0.8% | 29 | 4.7% | 7 | 1.1% | 10 | 1.6% | 11 | 1.8% | 62 | 10.0% |

## Table 40 I-90 Alternative - Minority Data for All Geographic Areas[a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| BG 2 | 855 | 4 | 0.5% | 12 | 1.4% | 4 | 0.5% | 19 | 2.2% | 22 | 2.6% | 61 | 7.1% |
| BG 3 | 824 | 10 | 1.2% | 32 | 3.9% | 3 | 0.4% | 13 | 1.6% | 14 | 1.7% | 72 | 8.7% |
| BG 4 | 741 | 7 | 0.9% | 28 | 3.8% | 5 | 0.7% | 26 | 3.5% | 12 | 1.6% | 78 | 10.5% |
| CT 9662 | 5,556 | 32 | 0.6% | 126 | 2.3% | 31 | 0.6% | 32 | 0.6% | 96 | 1.7% | 317 | 5.7% |
| BG 1 | 2,321 | 18 | 0.8% | 19 | 0.8% | 23 | 1.0% | 2 | 0.1% | 19 | 0.8% | 81 | 3.5% |
| BG 2 | 983 | 1 | 0.1% | 8 | 0.8% | 5 | 0.5% | 1 | 0.1% | 20 | 2.0% | 35 | 3.6% |
| BG 3 | 1,087 | 5 | 0.5% | 32 | 2.9% | 3 | 0.3% | 2 | 0.2% | 22 | 2.0% | 64 | 5.9% |
| BG 4 | 1,165 | 8 | 0.7% | 67 | 5.8% | 0 | 0.0% | 27 | 2.3% | 35 | 3.0% | 137 | 11.8% |
| CT 9663.01 | 3,462 | 23 | 0.7% | 181 | 5.2% | 11 | 0.3% | 32 | 0.9% | 35 | 1.0% | 282 | 8.1% |
| BG 1 | 1,129 | 5 | 0.4% | 9 | 0.8% | 5 | 0.4% | 8 | 0.7% | 13 | 1.2% | 40 | 3.5% |
| BG 2 | 2,333 | 18 | 0.8% | 172 | 7.4% | 6 | 0.3% | 24 | 1.0% | 22 | 0.9% | 242 | 10.4% |
| CT 9663.02 | 6,575 | 248 | 3.8% | 140 | 2.1% | 51 | 0.8% | 106 | 1.6% | 97 | 1.5% | 642 | 9.8% |
| BG 1 | 2,136 | 10 | 0.5% | 51 | 2.4% | 14 | 0.7% | 32 | 1.5% | 35 | 1.6% | 142 | 6.6% |
| BG 2 | 1,554 | 216 | 13.9% | 41 | 2.6% | 24 | 1.5% | 62 | 4.0% | 33 | 2.1% | 376 | 24.2% |
| BG 3 | 1,010 | 10 | 1.0% | 15 | 1.5% | 4 | 0.4% | 3 | 0.3% | 17 | 1.7% | 49 | 4.9% |
| BG 4 | 1,875 | 12 | 0.6% | 33 | 1.8% | 9 | 0.5% | 9 | 0.5% | 12 | 0.6% | 75 | 4.0% |
| CT 9664 | 3,807 | 11 | 0.3% | 24 | 0.6% | 11 | 0.3% | 14 | 0.4% | 35 | 0.9% | 95 | 2.5% |
| BG 1 | 724 | 1 | 0.1% | 2 | 0.3% | 0 | 0.0% | 7 | 1.0% | 1 | 0.1% | 11 | 1.5% |
| BG 2 | 780 | 3 | 0.4% | 9 | 1.2% | 1 | 0.1% | 3 | 0.4% | 19 | 2.4% | 35 | 4.5% |
| BG 4 | 604 | 0 | 0.0% | 6 | 1.0% | 0 | 0.0% | 0 | 0.0% | 4 | 0.7% | 10 | 1.7% |
| BG 5 | 981 | 1 | 0.1% | 7 | 0.7% | 3 | 0.3% | 4 | 0.4% | 11 | 1.1% | 26 | 2.7% |
| *South Dakota Exceedance Criteria* | | *1.5%* | | *10.6%* | | *1.2%* | | *1.1%* | | *2.5%* | | *16.9%* | |
| **Nebraska** | **1,826,341** | **82,885** | **4.5%** | **18,427** | **1.0%** | **33,572** | **1.8%** | **79,109** | **4.3%** | **39,510** | **2.2%** | **253,503** | **13.9%** |
| Cedar | 8,852 | 7 | 0.1% | 22 | 0.2% | 7 | 0.1% | 52 | 0.6% | 61 | 0.7% | 149 | 1.7% |
| CT 9771 | 4,656 | 5 | 0.1% | 12 | 0.3% | 1 | 0.0% | 9 | 0.2% | 28 | 0.6% | 55 | 1.2% |
| BG 1 | 1,181 | 1 | 0.1% | 3 | 0.3% | 0 | 0.0% | 0 | 0.0% | 7 | 0.6% | 11 | 0.9% |
| BG 2 | 821 | 0 | 0.0% | 1 | 0.1% | 0 | 0.0% | 2 | 0.2% | 2 | 0.2% | 5 | 0.6% |
| BG 3 | 769 | 0 | 0.0% | 5 | 0.7% | 0 | 0.0% | 2 | 0.3% | 13 | 1.7% | 20 | 2.6% |
| BG 4 | 887 | 1 | 0.1% | 1 | 0.1% | 0 | 0.0% | 5 | 0.6% | 2 | 0.2% | 9 | 1.0% |

## Table 40 I-90 Alternative - Minority Data for All Geographic Areas [a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| BG 5 | 998 | 3 | 0.3% | 2 | 0.2% | 1 | 0.1% | 0 | 0.0% | 4 | 0.4% | 10 | 1.0% |
| CT 9772 | 4,196 | 2 | 0.0% | 10 | 0.2% | 6 | 0.1% | 43 | 1.0% | 33 | 0.8% | 94 | 2.2% |
| BG 3 | 945 | 0 | 0.0% | 4 | 0.4% | 0 | 0.0% | 0 | 0.0% | 7 | 0.7% | 11 | 1.2% |
| BG 4 | 1,181 | 0 | 0.0% | 3 | 0.3% | 2 | 0.2% | 16 | 1.4% | 5 | 0.4% | 26 | 2.2% |
| Wayne | 9,595 | 129 | 1.3% | 32 | 0.3% | 63 | 0.7% | 173 | 1.8% | 107 | 1.1% | 504 | 5.3% |
| CT 9786 | 3,683 | 7 | 0.2% | 6 | 0.2% | 14 | 0.4% | 60 | 1.6% | 20 | 0.5% | 107 | 2.9% |
| BG 1 | 860 | 1 | 0.1% | 0 | 0.0% | 2 | 0.2% | 10 | 1.2% | 0 | 0.0% | 13 | 1.5% |
| BG 2 | 753 | 2 | 0.3% | 2 | 0.3% | 7 | 0.9% | 1 | 0.1% | 8 | 1.1% | 20 | 2.7% |
| BG 3 | 868 | 2 | 0.2% | 4 | 0.5% | 2 | 0.2% | 3 | 0.3% | 3 | 0.3% | 14 | 1.6% |
| Stanton | 6,129 | 41 | 0.7% | 25 | 0.4% | 6 | 0.1% | 173 | 2.8% | 70 | 1.1% | 315 | 5.1% |
| CT 9621 | 1,593 | 1 | 0.1% | 4 | 0.3% | 1 | 0.1% | 23 | 1.4% | 15 | 0.9% | 44 | 2.8% |
| BG 2 | 706 | 1 | 0.1% | 0 | 0.0% | 1 | 0.1% | 9 | 1.3% | 1 | 0.1% | 12 | 1.7% |
| CT 9622 | 4,536 | 40 | 0.9% | 21 | 0.5% | 5 | 0.1% | 150 | 3.3% | 55 | 1.2% | 271 | 6.0% |
| BG 1 | 1,471 | 16 | 1.1% | 14 | 1.0% | 0 | 0.0% | 50 | 3.4% | 14 | 1.0% | 94 | 6.4% |
| BG 2 | 865 | 11 | 1.3% | 0 | 0.0% | 4 | 0.5% | 16 | 1.8% | 15 | 1.7% | 46 | 5.3% |
| BG 3 | 819 | 0 | 0.0% | 4 | 0.5% | 1 | 0.1% | 10 | 1.2% | 9 | 1.1% | 24 | 2.9% |
| BG 4 | 1,381 | 13 | 0.9% | 3 | 0.2% | 0 | 0.0% | 74 | 5.4% | 17 | 1.2% | 107 | 7.8% |
| Platte | 32,237 | 145 | 0.4% | 219 | 0.7% | 163 | 0.5% | 2,213 | 6.9% | 476 | 1.5% | 3,216 | 10.0% |
| CT 9651 | 3,737 | 8 | 0.2% | 8 | 0.2% | 11 | 0.3% | 18 | 0.5% | 16 | 0.4% | 61 | 1.6% |
| BG 3 | 1,260 | 1 | 0.1% | 1 | 0.1% | 9 | 0.7% | 3 | 0.2% | 4 | 0.3% | 18 | 1.4% |
| CT 9652.98 | 3,208 | 6 | 0.2% | 10 | 0.3% | 14 | 0.4% | 22 | 0.7% | 18 | 0.6% | 70 | 2.2% |
| BG 4 | 820 | 3 | 0.4% | 7 | 0.9% | 3 | 0.4% | 2 | 0.2% | 1 | 0.1% | 16 | 2.0% |
| CT 9654 | 4,806 | 16 | 0.3% | 42 | 0.9% | 28 | 0.6% | 755 | 15.7% | 67 | 1.4% | 908 | 18.9% |
| BG 1 | 1,807 | 9 | 0.5% | 12 | 0.7% | 9 | 0.5% | 287 | 15.9% | 47 | 2.6% | 364 | 20.1% |
| Colfax | 10,515 | 89 | 0.8% | 114 | 1.1% | 33 | 0.3% | 2,431 | 23.1% | 213 | 2.0% | 2,880 | 27.4% |
| CT 9646 | 2,225 | 0 | 0.0% | 4 | 0.2% | 6 | 0.3% | 25 | 1.1% | 14 | 0.6% | 49 | 2.2% |
| BG 3 | 612 | 0 | 0.0% | 1 | 0.2% | 0 | 0.0% | 18 | 2.9% | 1 | 0.2% | 20 | 3.3% |
| CT 9647 | 1,774 | 6 | 0.3% | 2 | 0.1% | 9 | 0.5% | 95 | 5.4% | 14 | 0.8% | 126 | 7.1% |
| BG 1 | 1,091 | 0 | 0.0% | 1 | 0.1% | 6 | 0.5% | 39 | 3.6% | 9 | 0.8% | 55 | 5.0% |
| BG 2 | 683 | 6 | 0.9% | 1 | 0.1% | 3 | 0.4% | 56 | 8.2% | 5 | 0.7% | 71 | 10.4% |

## Table 40 I-90 Alternative - Minority Data for All Geographic Areas [a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| Butler | 8,395 | 24 | 0.3% | 11 | 0.1% | 27 | 0.3% | 84 | 1.0% | 57 | 0.7% | 203 | 2.4% |
| CT 9676 | 3,327 | 4 | 0.1% | 4 | 0.1% | 6 | 0.2% | 30 | 0.9% | 23 | 0.7% | 67 | 2.0% |
| BG 1 | 1,166 | 1 | 0.1% | 3 | 0.3% | 4 | 0.3% | 15 | 1.3% | 16 | 1.4% | 39 | 3.3% |
| BG 2 | 1,273 | 3 | 0.2% | 1 | 0.1% | 2 | 0.2% | 10 | 0.8% | 3 | 0.2% | 19 | 1.5% |
| BG 3 | 888 | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 5 | 0.6% | 4 | 0.5% | 9 | 1.0% |
| CT 9677 | 3,110 | 19 | 0.6% | 2 | 0.1% | 19 | 0.6% | 52 | 1.7% | 26 | 0.8% | 118 | 3.8% |
| BG 2 | 1,330 | 18 | 1.4% | 2 | 0.2% | 8 | 0.6% | 43 | 3.2% | 8 | 0.6% | 79 | 5.9% |
| CT 9678 | 1,958 | 1 | 0.1% | 5 | 0.3% | 2 | 0.1% | 2 | 0.1% | 8 | 0.4% | 18 | 0.9% |
| BG 2 | 856 | 1 | 0.1% | 5 | 0.6% | 0 | 0.0% | 0 | 0.0% | 6 | 0.7% | 12 | 1.4% |
| Seward | 16,750 | 60 | 0.4% | 53 | 0.3% | 74 | 0.4% | 68 | 0.4% | 180 | 1.1% | 435 | 2.6% |
| CT 9601 | 4,378 | 8 | 0.2% | 13 | 0.3% | 13 | 0.3% | 19 | 0.4% | 29 | 0.7% | 82 | 1.9% |
| BG 1 | 1,619 | 5 | 0.3% | 10 | 0.6% | 4 | 0.2% | 7 | 0.4% | 14 | 0.9% | 40 | 2.5% |
| BG 2 | 1,178 | 1 | 0.1% | 0 | 0.0% | 1 | 0.1% | 1 | 0.1% | 6 | 0.5% | 9 | 0.8% |
| BG 3 | 1,581 | 2 | 0.1% | 3 | 0.2% | 8 | 0.5% | 11 | 0.7% | 9 | 0.6% | 33 | 2.1% |
| CT 9602 | 2,285 | 18 | 0.8% | 9 | 0.4% | 11 | 0.5% | 7 | 0.3% | 49 | 2.1% | 94 | 4.1% |
| BG 1 | 1,302 | 16 | 1.2% | 6 | 0.5% | 9 | 0.7% | 6 | 0.5% | 24 | 1.8% | 61 | 4.7% |
| BG 2 | 983 | 2 | 0.2% | 3 | 0.3% | 2 | 0.2% | 1 | 0.1% | 25 | 2.5% | 33 | 3.4% |
| CT 9603 | 5,099 | 23 | 0.5% | 16 | 0.3% | 35 | 0.7% | 19 | 0.4% | 46 | 0.9% | 139 | 2.7% |
| BG 1 | 1,580 | 3 | 0.2% | 4 | 0.3% | 8 | 0.5% | 7 | 0.4% | 10 | 0.6% | 32 | 2.0% |
| BG 2 | 1,632 | 1 | 0.1% | 4 | 0.2% | 14 | 0.9% | 4 | 0.2% | 14 | 0.9% | 37 | 2.3% |
| BG 3 | 1,887 | 19 | 1.0% | 8 | 0.4% | 13 | 0.7% | 8 | 0.4% | 22 | 1.2% | 70 | 3.7% |
| CT 9604 | 4,988 | 11 | 0.2% | 15 | 0.3% | 15 | 0.3% | 23 | 0.5% | 56 | 1.1% | 120 | 2.4% |
| BG 1 | 1,250 | 0 | 0.0% | 2 | 0.2% | 9 | 0.7% | 6 | 0.5% | 18 | 1.4% | 35 | 2.8% |
| BG 2 | 1,358 | 5 | 0.4% | 3 | 0.2% | 2 | 0.1% | 2 | 0.1% | 12 | 0.9% | 24 | 1.8% |
| BG 3 | 1,427 | 5 | 0.4% | 3 | 0.2% | 2 | 0.1% | 11 | 0.8% | 19 | 1.3% | 40 | 2.8% |
| Saline | 14,200 | 125 | 0.9% | 55 | 0.4% | 239 | 1.7% | 1,775 | 12.5% | 223 | 1.6% | 2,417 | 17.0% |
| CT 9607 | 2,110 | 11 | 0.5% | 2 | 0.1% | 5 | 0.2% | 50 | 2.4% | 18 | 0.9% | 86 | 4.1% |
| BG 1 | 1,010 | 6 | 0.6% | 1 | 0.1% | 1 | 0.1% | 45 | 4.5% | 11 | 1.1% | 64 | 6.3% |
| CT 9608 | 1,496 | 4 | 0.3% | 2 | 0.1% | 3 | 0.2% | 22 | 1.5% | 14 | 0.9% | 45 | 3.0% |
| BG 1 | 876 | 2 | 0.2% | 1 | 0.1% | 0 | 0.0% | 9 | 1.0% | 14 | 1.6% | 26 | 3.0% |

## Table 40 I-90 Alternative - Minority Data for All Geographic Areas[a]

| Geographic Area | Total Population | African American | | American Indian/ Alaska Native | | Asian/Pacific Islander | | Other | | Two or More Races | | Aggregate (Total) of Racial Minorities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | # | % | # | % | # | % | # | % | # | % | # | % |
| CT 9609 | 3,076 | 38 | 1.2% | 17 | 0.6% | 43 | 1.4% | 75 | 2.4% | 33 | 1.1% | 206 | 6.7% |
| BG 1 | 1,325 | 6 | 0.5% | 9 | 0.7% | 28 | 2.1% | 49 | 3.7% | 19 | 1.4% | 111 | 8.4% |
| BG 2 | 1,751 | 32 | 1.8% | 8 | 0.5% | 15 | 0.9% | 26 | 1.5% | 14 | 0.8% | 95 | 5.4% |
| Jefferson | 7,547 | 24 | 0.3% | 27 | 0.4% | 20 | 0.3% | 62 | 0.8% | 91 | 1.2% | 224 | 3.0% |
| CT 9636 | 3,294 | 10 | 0.3% | 3 | 0.1% | 5 | 0.2% | 19 | 0.6% | 22 | 0.7% | 59 | 1.8% |
| BG 1 | 1,266 | 1 | 0.1% | 0 | 0.0% | 3 | 0.2% | 4 | 0.3% | 7 | 0.6% | 15 | 1.2% |
| BG 2 | 705 | 8 | 1.1% | 1 | 0.1% | 1 | 0.1% | 5 | 0.7% | 3 | 0.4% | 18 | 2.6% |
| BG 3 | 1,323 | 1 | 0.1% | 2 | 0.2% | 1 | 0.1% | 10 | 0.8% | 12 | 0.9% | 26 | 2.0% |
| *Nebraska Exceedance Criteria* | | *5.4%* | | *1.2%* | | *2.2%* | | *5.2%* | | *2.6%* | | *16.7%* | |

Sources: Total population and minority populations for each race (Race, U.S. Census Bureau 2012b).

[a] Data is presented only for geographic areas along the I-90 Corridor Alternative route that differ from the proposed Project route.
Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
Values less than 0.1 percent are expressed as 0.0 percent.
CT = Census Tract, BG = Block Group.
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## Table 41 I-90 Alternative – Hispanic and Latino Origin Data for All Geographic Areas [a]

| Geographic Area | Total Population # | Hispanic or Latino[b] # | % |
|---|---|---|---|
| **South Dakota** | **814,180** | **22,119** | **2.7%** |
| Jones | 1,006 | 13 | 1.3% |
| CT 916 | 1,006 | 13 | 1.3% |
| BG 1 | 1,006 | 13 | 1.3% |
| Lyman | 3,755 | 42 | 1.1% |
| CT 9726 | 2,275 | 21 | 0.9% |
| BG 1 | 915 | 12 | 1.3% |
| BG 2 | 549 | 1 | 0.2% |
| BG 3 | 811 | 16 | 2.0% |
| Brule | 5,255 | 75 | 1.4% |
| CT 9731 | 2,657 | 37 | 1.4% |
| BG 1 | 876 | 21 | 2.4% |
| BG 2 | 792 | 10 | 1.3% |
| BG 3 | 989 | 9 | 0.9% |
| CT 9732 | 2,598 | 38 | 1.5% |
| BG 1 | 756 | 16 | 2.1% |
| BG 2 | 1,253 | 18 | 1.4% |
| BG 3 | 589 | 13 | 2.2% |
| Aurora | 2,710 | 101 | 3.7% |
| CT 9736 | 2,710 | 101 | 3.7% |
| BG 1 | 472 | 18 | 3.8% |
| BG 2 | 908 | 77 | 8.5% |
| BG 3 | 684 | 1 | 0.1% |
| BG 4 | 646 | 6 | 0.9% |
| Davison | 19,504 | 294 | 1.5% |
| CT 9626 | 2,919 | 27 | 0.9% |
| BG 1 | 979 | 16 | 1.6% |
| BG 2 | 855 | 14 | 1.6% |
| BG 3 | 1,085 | 2 | 0.2% |
| CT 9627 | 5,467 | 44 | 0.8% |
| BG 1 | 1,631 | 18 | 1.1% |
| CT 9628 | 6,111 | 113 | 1.8% |
| BG 1 | 905 | 37 | 4.1% |
| BG 2 | 977 | 26 | 2.7% |
| BG 3 | 1,072 | 34 | 3.2% |
| BG 4 | 741 | 7 | 0.9% |
| BG 5 | 1,388 | 12 | 0.9% |
| BG 6 | 1,028 | 12 | 1.2% |
| CT 9629 | 5,007 | 110 | 2.2% |
| BG 1 | 1,123 | 21 | 1.9% |
| BG 2 | 1,038 | 6 | 0.6% |
| BG 3 | 1,002 | 27 | 2.7% |
| BG 4 | 924 | 45 | 4.9% |

## Table 41 I-90 Alternative – Hispanic and Latino Origin Data for All Geographic Areas[a]

| Geographic Area | Total Population # | Hispanic or Latino[b] # | % |
|---|---|---|---|
| BG 5 | 920 | 28 | 3.0% |
| Hanson | 3,331 | 15 | 0.5% |
| CT 9641 | 3,331 | 15 | 0.5% |
| BG 1 | 911 | 0 | 0.0% |
| BG 2 | 1,242 | 16 | 1.3% |
| BG 3 | 1,178 | 2 | 0.2% |
| McCook | 5,618 | 99 | 1.8% |
| CT 9647 | 2,405 | 51 | 2.1% |
| BG 1 | 933 | 15 | 1.6% |
| BG 3 | 689 | 15 | 2.2% |
| Hutchinson | 7,343 | 120 | 1.6% |
| CT 9686 | 3,153 | 93 | 2.9% |
| BG 1 | 1,104 | 13 | 1.2% |
| BG 2 | 1,378 | 85 | 6.2% |
| Yankton | 22,438 | 614 | 2.7% |
| CT 9661 | 3,038 | 133 | 4.4% |
| BG 1 | 618 | 27 | 4.4% |
| BG 2 | 855 | 43 | 5.0% |
| BG 3 | 824 | 31 | 3.8% |
| BG 4 | 741 | 38 | 5.1% |
| CT 9662 | 5,556 | 113 | 2.0% |
| BG 1 | 2,321 | 17 | 0.7% |
| BG 2 | 983 | 39 | 4.0% |
| BG 3 | 1,087 | 20 | 1.8% |
| BG 4 | 1,165 | 55 | 4.7% |
| CT 9663.01 | 3,462 | 48 | 1.4% |
| BG 1 | 1,129 | 19 | 1.7% |
| BG 2 | 2,333 | 30 | 1.3% |
| CT 9663.02 | 6,575 | 281 | 4.3% |
| BG 1 | 2,136 | 86 | 4.0% |
| BG 2 | 1,554 | 151 | 9.7% |
| BG 3 | 1,010 | 21 | 2.1% |
| BG 4 | 1,875 | 49 | 2.6% |
| CT 9664 | 3,807 | 39 | 1.0% |
| BG 1 | 724 | 11 | 1.5% |
| BG 2 | 780 | 15 | 1.9% |
| BG 4 | 604 | 4 | 0.7% |
| BG 5 | 981 | 14 | 1.4% |
| *South Dakota Exceedance Criteria* | | *3.2%* | |
| **Nebraska** | **1,826,341** | **167,405** | **9.2** |
| Cedar | 8,852 | 113 | 1.3% |
| CT 9771 | 4,656 | 46 | 1.0% |
| BG 1 | 1,181 | 0 | 0.0% |

## Table 41 I-90 Alternative – Hispanic and Latino Origin Data for All Geographic Areas [a]

| Geographic Area | Total Population # | Hispanic or Latino[b] # | % |
|---|---|---|---|
| BG 2 | 821 | 4 | 0.5% |
| BG 3 | 769 | 31 | 4.0% |
| BG 4 | 887 | 14 | 1.6% |
| BG 5 | 998 | 4 | 0.4% |
| CT 9772 | 4,196 | 67 | 1.6% |
| BG 3 | 945 | 0 | 0.0% |
| BG 4 | 1,181 | 26 | 2.2% |
| Wayne | 9,595 | 401 | 4.2% |
| CT 9786 | 3,683 | 130 | 3.5% |
| BG 1 | 860 | 27 | 3.1% |
| BG 2 | 753 | 10 | 1.3% |
| BG 3 | 868 | 19 | 2.2% |
| Stanton | 6,129 | 281 | 4.6% |
| CT 9621 | 1,593 | 38 | 2.4% |
| BG 2 | 706 | 15 | 2.1% |
| CT 9622 | 4,536 | 243 | 5.4% |
| BG 1 | 1,471 | 87 | 5.9% |
| BG 2 | 865 | 38 | 4.4% |
| BG 3 | 819 | 25 | 3.1% |
| BG 4 | 1,381 | 116 | 8.4% |
| Platte | 32,237 | 4,452 | 13.8% |
| CT 9651 | 3,737 | 37 | 1.0% |
| BG 3 | 1,260 | 13 | 1.0% |
| CT 9652.98 | 3,208 | 48 | 1.5% |
| BG 4 | 820 | 8 | 1.0% |
| CT 9654 | 4,806 | 1,423 | 29.6% |
| BG 1 | 1,807 | 714 | 39.5% |
| Colfax | 10,515 | 4,315 | 41.0% |
| CT 9646 | 2,225 | 49 | 2.2% |
| BG 3 | 612 | 20 | 3.3% |
| CT 9647 | 1,774 | 169 | 9.5% |
| BG 1 | 1,091 | 81 | 7.4% |
| BG 2 | 683 | 97 | 14.2% |
| Butler | 8,395 | 195 | 2.3% |
| CT 9676 | 3,327 | 70 | 2.1% |
| BG 1 | 1,166 | 41 | 3.5% |
| BG 2 | 1,273 | 20 | 1.6% |
| BG 3 | 888 | 18 | 2.0% |
| CT 9677 | 3,110 | 107 | 3.4% |
| BG 2 | 1,330 | 81 | 6.1% |
| CT 9678 | 1,958 | 18 | 0.9% |
| BG 2 | 856 | 12 | 1.4% |
| Seward | 16,750 | 272 | 1.6% |

## Table 41 I-90 Alternative – Hispanic and Latino Origin Data for All Geographic Areas[a]

| Geographic Area | Total Population # | Hispanic or Latino[b] # | % |
|---|---|---|---|
| CT 9601 | 4,378 | 67 | 1.5% |
| BG 1 | 1,619 | 27 | 1.7% |
| BG 2 | 1,178 | 11 | 0.9% |
| BG 3 | 1,581 | 38 | 2.4% |
| CT 9602 | 2,285 | 43 | 1.9% |
| BG 1 | 1,302 | 37 | 2.8% |
| BG 2 | 983 | 14 | 1.4% |
| CT 9603 | 5,099 | 96 | 1.9% |
| BG 1 | 1,580 | 37 | 2.3% |
| BG 2 | 1,632 | 32 | 2.0% |
| BG 3 | 1,887 | 37 | 2.0% |
| CT 9604 | 4,988 | 66 | 1.3% |
| BG 1 | 1,250 | 23 | 1.8% |
| BG 2 | 1,358 | 21 | 1.5% |
| BG 3 | 1,427 | 23 | 1.6% |
| Saline | 14,200 | 2,870 | 20.2% |
| CT 9607 | 2,110 | 92 | 4.4% |
| BG 1 | 1,010 | 67 | 6.6% |
| CT 9608 | 1,496 | 40 | 2.7% |
| BG 1 | 876 | 25 | 2.9% |
| CT 9609 | 3,076 | 225 | 7.3% |
| BG 1 | 1,325 | 107 | 8.1% |
| BG 2 | 1,751 | 131 | 7.5% |
| Jefferson | 7,547 | 200 | 2.7% |
| CT 9636 | 3,294 | 69 | 2.1% |
| BG 1 | 1,266 | 27 | 2.1% |
| BG 2 | 705 | 13 | 1.8% |
| BG 3 | 1,323 | 39 | 2.9% |
| *Nebraska Exceedance Criteria* | | *11.0%* | |

Sources: Hispanic and Latino populations (Hispanic or Latino Origin by Race, U.S. Census Bureau 2012c).

[a] Data is presented only for geographic areas along the I-90 Corridor Alternative route that differ from the proposed Project route.
[b] Hispanic and Latino populations are not included in the aggregate minority count.
Notes: Gray shaded cells indicate minority populations that met the 50 percent and/or meaningfully greater criteria.
CT = Census Tract, BG = Block Group.

## Table 42 I-90 Alternative – Low-Income Data for All Geographic Areas [a]

| Geographic Area | Population for Whom Poverty Status is Determined # | Aggregate (Total) of Low-Income Populations # | % |
|---|---|---|---|
| **South Dakota** | **771,100** | **105,819** | **13.7%** |
| Jones | 1,056 | 96 | 9.1% |
| CT 916 | 1,056 | 96 | 9.1% |
| Lyman | 3,720 | 699 | 18.8% |
| CT 9726 | 2,128 | 171 | 8.0% |
| Brule | 4,713 | 430 | 9.1% |
| CT 9731 | 2,324 | 194 | 8.3% |
| CT 9732 | 2,389 | 236 | 9.9% |
| Aurora | 2,647 | 218 | 8.2% |
| CT 9736 | 2,647 | 218 | 8.2% |
| Davison | 18,552 | 2,556 | 13.8% |
| CT 9626 | 2,991 | 122 | 4.1% |
| CT 9627 | 4,964 | 546 | 11.0% |
| CT 9628 | 5,623 | 822 | 14.6% |
| CT 9629 | 4,974 | 1,066 | 21.4% |
| Hanson | 3,375 | 461 | 13.7% |
| CT 9641 | 3,375 | 461 | 13.7% |
| McCook | 5,459 | 429 | 7.9% |
| CT 9647 | 2,258 | 191 | 8.5% |
| Hutchinson | 7,121 | 743 | 10.4% |
| CT 9686 | 3,113 | 395 | 12.7% |
| Yankton | 20,264 | 2,275 | 11.2% |
| CT 9661 | 2,669 | 492 | 18.4% |
| CT 9662 | 5,344 | 606 | 11.3% |
| CT 9663.01 | 2,726 | 147 | 5.4% |
| CT 9663.02 | 5,442 | 768 | 14.1% |
| CT 9664 | 4,083 | 262 | 6.4% |
| *South Dakota Exceedance Criteria* | | *16.5%* | |
| **Nebraska** | **1,744,704** | **206,227** | **11.8%** |
| Cedar | 8,726 | 922 | 10.6% |
| CT 9771 | 4,524 | 623 | 13.8% |
| CT 9772 | 4,202 | 299 | 7.1% |
| Wayne | 8,320 | 1,309 | 15.7% |
| CT 9786 | 3,814 | 477 | 12.5% |
| Stanton | 6,156 | 675 | 11.0% |
| CT 9621 | 1,756 | 119 | 6.8% |
| CT 9622 | 4,400 | 556 | 12.6% |
| Platte | 31,396 | 2,498 | 8.0% |
| CT 9651 | 3,859 | 306 | 7.9% |
| CT 9652.98 | 3,229 | 289 | 9.0% |
| CT 9654 | 4,507 | 92 | 2.0% |
| Colfax | 10,051 | 1,101 | 11.0% |
| CT 9646 | 2,352 | 165 | 7.0% |
| CT 9647 | 1,468 | 74 | 5.0% |
| Butler | 8,270 | 756 | 9.1% |
| CT 9676 | 3,110 | 241 | 7.7% |
| CT 9677 | 3,034 | 323 | 10.6% |
| CT 9678 | 2,126 | 192 | 9.0% |

## Table 42 I-90 Alternative – Low-Income Data for All Geographic Areas [a]

| Geographic Area | Population for Whom Poverty Status is Determined # | Aggregate (Total) of Low-Income Populations # | % |
|---|---|---|---|
| Seward | 15,798 | 1,110 | 7.0% |
| CT 9601 | 4,243 | 274 | 6.5% |
| CT 9602 | 2,348 | 200 | 8.5% |
| CT 9603 | 4,247 | 155 | 3.6% |
| CT 9604 | 4,960 | 481 | 9.7% |
| Saline | 12,871 | 1,539 | 12.0% |
| CT 9607 | 2,133 | 129 | 6.0% |
| CT 9608 | 1,600 | 112 | 7.0% |
| CT 9609 | 2,868 | 177 | 6.2% |
| Jefferson | 7,668 | 958 | 12.5% |
| CT 9636 | 3,255 | 222 | 6.8% |
| *Nebraska Exceedance Criteria* | | *14.2%* | |

Source: U.S. Census Bureau 2006-2010 Poverty Status in the Past 12 Months (U.S. Census Bureau 2012a).

[a] Data is presented only for geographic areas along the I-90 Corridor Alternative route that differ from the proposed Project route
Notes: CT = Census Tract.
.

## Table 43 I-90 Alternative - Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within Census Block Groups and Tracts in Affected Counties[a]

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[b]: Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b]: Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/Populations (MUA/P)[e]: Designation Name |
|---|---|---|---|---|---|---|---|
| **South Dakota** | | | | | | | |
| Brule | 6 | 4 | 2 | 0 | Catchment Area 4 | Geographical Area (M) | Kimball City – County |
| Aurora | 4 | 3 | 1 | 0 | Wessington Springs<br>Catchment Area 4 | Geographical Area (P, D)<br>Geographical Area (M) | Aurora Service Area |
| Davison | 15 | 7 | 4 | 1 | Corsica/Armour<br>Catchment Area 4 | Geographical Area (P)<br>Geographical Area (M) | NA |
| Hanson | 3 | 0 | 1 | 0 | Salem<br>Catchment Area 4 | Geographical Area (P)<br>Geographical Area (M) | Hanson Service Area |
| McCook | 2 | 0 | 1 | 0 | Salem<br>Low-Income – McCook County | Geographical Area (P)<br>Population Group (D) | McCook Service Area |
| Hutchinson | 2 | 1 | 1 | 0 | Menno Clinic<br>Catchment Area 12 | Rural Health Clinic (P)<br>Geographical Area (M) | Hutchinson Service Area |
| Yankton | 18 | 8 | 5 | 1 | South Dakota Human Services Center<br>Catchment Area 12 | State Mental Hospital (M)<br>Geographical Area (M) | Low-Income – Yankton County |
| *Subtotal South Dakota* | *50* | *23* | *17* | *2* | | | |

## Table 43 I-90 Alternative - Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within Census Block Groups and Tracts in Affected Counties[a]

| County | Total Number of Census Block Groups Assessed | Census Block Groups Containing One or More Identified Minority Populations | Total Number of Census Tracts Assessed | Census Tracts Containing One or More Identified Low-Income Populations | Health Professional Shortage Areas (HPSA)[b] Designation Name / Facility Location[c] | Health Professional Shortage Areas (HPSA)[b] Geographic Area or Facility Type[d] (P= Primary Medical Care; D= Dental; M = Mental Health) | Medically Underserved Areas/Populations (MUA/P)[e] Designation Name |
|---|---|---|---|---|---|---|---|
| **Nebraska** | | | | | | | |
| Cedar | 7 | 0 | 2 | 0 | Laurel Mercy Medical Clinic<br>Catchment Area 4 | Rural Health Clinic (P, D, M)<br>Geographical Area (M) | Cedar Service Area |
| Wayne | 3 | 0 | 1 | 0 | Wayne Mercy Medical Clinic<br>Catchment Area 4 | Rural Health Clinic (P, D, M)<br>Geographical Area (M) | Chapin Precinct – County |
| Stanton | 5 | 1 | 2 | 0 | Catchment Area 4 | Geographical Area (M) | Stanton Service Area |
| Platte | 3 | 1 | 3 | 0 | Good Neighbor Community Health Center<br>Catchment Area 4 | Comprehensive Health Center (P, D, M)<br>Geographical Area (M) | St. Bernard Service Area |
| Colfax | 3 | 1 | 2 | 0 | Howells Family Practice Alegent Health Schuyler Clinic<br>Alegent Health Howells Clinic<br>Alegent Health Clarkson Clinic<br>Catchment Area 4 | Rural Health Clinic (P, D, M)<br>Rural Health Clinic (P, D, M)<br>Rural Health Clinic (P, D, M)<br>Rural Health Clinic (P, D, M)<br>Geographical Area (M) | Adams Precinct Service Area<br>Schuyler City – County |
| Butler | 5 | 0 | 3 | 0 | Mental Health Catchment Area 5 | Geographical Area (M) | David City Service Area |

**Table 43 I-90 Alternative - Designated HPSAs and MUA/Ps with Identified Minority and/or Low-Income Populations within Census Block Groups and Tracts in Affected Counties** [a]

| | | | | | Health Professional Shortage Areas (HPSA)[b] | | Medically Underserved Areas/Populations (MUA/P)[e] |
|---|---|---|---|---|---|---|---|
| **County** | **Total Number of Census Block Groups Assessed** | **Census Block Groups Containing One or More Identified Minority Populations** | **Total Number of Census Tracts Assessed** | **Census Tracts Containing One or More Identified Low-Income Populations** | **Designation Name / Facility Location**[c] | **Geographic Area or Facility Type**[d] **(P= Primary Medical Care; D= Dental; M = Mental Health)** | **Designation Name** |
| Seward | 11 | 0 | 4 | 0 | Mental Health Catchment Area 5 | Geographical Area (M) | NA |
| *Subtotal Nebraska* | *37* | *3* | *17* | *0* | | | |

Source: HRSA 2012.

[a] Data is presented only for geographic areas along the I-90 Corridor Alternative route that differ from the proposed Project route.
[b] Health Professional Shortage Areas (HPSAs) are designated by HRSA as having shortages of primary medical care, dental or mental health providers and may be geographic (a county or service area), demographic (low income population) or institutional (comprehensive health center, federally qualified health center or other. public facility).
[c] Satellite sites of Comprehensive Health Centers automatically assume the HPSA score of the affiliated grantee. They are not listed separately.
[d] Geographic Single County is defined as a whole county designated as HPSA; Geographic Service Areas are portions of a county, or portions of multiple counties, designated as a geographic HPSA; Population Groups are defined as a population within an area that is designated as a HPSA; Correctional Institutions are Federal and State prisons and youth detention facilities; Rural Health Clinics are certified as Rural Health Clinics by the Centers for Medicare and Medicaid Services; Indian Health Service sites serve Federally Recognized tribes.
[e] Medically Underserved Areas/Populations are areas or populations designated by HRSA as having: too few primary care providers, high infant mortality, high poverty and/or high elderly population.

## Table 44 I-90 Corridor Alternative – Public Services

| State / County[a,b] | Police / Sheriff Departments[c] | Fire Departments[d] | Nearest Medical Facilities (City)[e] |
|---|---|---|---|
| **South Dakota** | | | |
| Brule | 2 | 3 | Sanford Clinic Chamberlain (Chamberlain)<br>Sanford Mid-Dakota Hospital (Chamberlain)<br>Mid-Dakota Medical Center (Chamberlain) |
| Aurora | 2 | 1 | Kimball Ambulance Service (Kimball)<br>Price Medical Group (Kimball) |
| Davison | 2 | 2 | Avera Queen of Peace Hospital (Mitchell)<br>Avera St Benedict Health Center (Mitchell) |
| Hanson | 1 | 3 | Avera Queen of Peace Hospital (Mitchell)<br>Avera St Benedict Health Center (Mitchell) |
| McCook | 1 | 4 | McCook County Ambulance (Salem) |
| Hutchinson | 3 | 3 | Freeman Regional Health Services (Freeman)<br>Landmann-Jungman memorial Hospital (Scotland) |
| Yankton | 2 | 3 | Avera Sacred Heart Hospital (Yankton)<br>Yankton Medical Clinic (Yankton) |
| **Nebraska** | | | |
| Cedar | 4 | 7 | Avera Sacred Heart Hospital (Yankton) |
| Wayne | 2 | 4 | Providence Medical Center (Wayne) |
| Stanton | 1 | 2 | Faith Regional Health Services (Norfolk)<br>Urgent Care Center of Norfolk (Norfolk) |
| Platte | 3 | 4 | Humphrey Medical Clinic (Humphrey)<br>Columbus Community Hospital (Columbus) |
| Colfax | 4 | 3 | Humphrey Medical Clinic (Humphrey)<br>Columbus Community Hospital (Columbus)<br>Columbus Medical Center (Columbus) |
| Butler | 2 | 9 | Butler County Health Care Center (David City) |
| Seward | 3 | 5 | Seward Memorial Hospital (Seward) |

[a] Data is presented only for counties along the I-90 Corridor Alternative route that differ from the proposed Project route.
[b] States, counties, and cities are listed geographically from north to south as proposed project crosses the area.
[c] Number of Police and Sheriff Departments determined from local, regional, and national records pertaining to Law Enforcement Agencies as listed on the website usacops.com (2012).
[d] Number of Fire Departments determined from community database of Fire Departments in the United States as listed on the website Firedepartmentdirectory.com (2012).
[e] Medical facility located at a distance no further than approximately 50 miles from Project Area.

**Table 45 County Property Tax Comparison of Proposed Project and I-90 Corridor Alternative (in thousands of 2010 dollars)**

| State/County | Proposed Project | I-90 Corridor Alternative |
|---|---|---|
| Montana Total | $6,135 | $6,135 |
| Phillips | $545 | $545 |
| Valley | $1,441 | $1,441 |
| McCone | $1,010 | $1,010 |
| Dawson | $811 | $811 |
| Prairie | $353 | $353 |
| Fallon | $1,975 | $1,975 |
| South Dakota Total | $16,680 | $22,585 |
| Harding | $3,492 | $2,453 |
| Butte | $167 | $132 |
| Perkins | $945 | $595 |
| Meade | $3,496 | $2,279 |
| Pennington | $97 | $62 |
| Haakon | $3,163 | $1,472 |
| Jones | $1,526 | $835 |
| Lyman | $532 | $1,533 |
| Tripp | $3,257 | NA |
| Gregory | $5 | NA |
| Brule | NA | $968 |
| Aurora | NA | $751 |
| Davison | NA | $845 |
| Hanson | NA | $719 |
| Hutchinson | NA | $846 |
| McCook | NA | $319 |
| Yankton | NA | $918 |
| Nebraska Total | $11,810 | $9,632 |
| Keya Paha | $436 | NA |
| Boyd | $311 | NA |
| Rock | NA | NA |
| Holt | $3,050 | NA |
| Garfield | NA | NA |
| Wheeler | NA | NA |
| Greeley | NA | NA |
| Antelope | $2,341 | NA |
| Boone | $943 | NA |
| Nance | $969 | NA |
| Merrick | $288 | NA |
| Polk | $481 | NA |
| Hamilton | NA | NA |
| York | $932 | NA |
| Fillmore | $500 | NA |
| Cedar | NA | $1,602 |
| Wayne | NA | $918 |
| Stanton | NA | $1,120 |
| Platte | NA | $197 |
| Colfax | NA | $1,095 |
| Butler | NA | $1,137 |
| Seward | NA | $1,194 |
| Saline | $567 | $1,336 |

**Table 45 County Property Tax Comparison of Proposed Project and I-90 Corridor Alternative (in thousands of 2010 dollars)**

| State/County | Proposed Project | I-90 Corridor Alternative |
|---|---|---|
| Jefferson | $993 | $1,033 |

Note: NA indicates that the county does not contain Keystone facilities, so the county would not levy a property tax.
The estimates in the table roughly approximate the property tax amount that could be paid annually. However, the amount of property tax revenue paid in the first year or any subsequent year of operations will likely vary over time because of the many factors that determine how much a pipeline company must pay in local property taxes in any given year.

## Table 46 I-90 Corridor Alternative – Property Tax Revenue in Situs Counties, 2010

| County | Total Property Value in County | Total Property Tax Revenue | Effective Property Tax Rate |
|---|---|---|---|
| **Montana** | | | |
| Phillips | $401,090,831 | $8,062,381 | 2.0% |
| Valley | 551,323,709 | 14,706,595 | 2.7% |
| McCone | 246,556,992 | 3,892,575 | 1.6% |
| Dawson | 467,623,239 | 13,204,292 | 2.8% |
| Prairie | 106,386,478 | 2,613,113 | 2.5% |
| Fallon | 436,070,972 | 7,123,109 | 1.6% |
| Total | $2,209,052,221 | $49,602,065 | 2.2% |
| **South Dakota** | | | |
| Harding | $215,566,625 | $2,731,191 | 1.3% |
| Butte | 595,452,581 | 9,498,634 | 1.6% |
| Perkins | 318,254,493 | 4,468,261 | 1.4% |
| Meade | 1,662,772,219 | 28,166,408 | 1.7% |
| Pennington | 7,649,711,805 | 133,409,959 | 1.7% |
| Haakon | 336,585,980 | 3,049,053 | 0.9% |
| Jones | 229,359,183 | 1,982,019 | 0.9% |
| Lyman | 409,288,275 | 4,240,216 | 1.0% |
| Brule | 434,662,325 | 6,089,743 | 1.4% |
| Aurora | 364,526,155 | 4,774,539 | 1.3% |
| Davison | 1,087,493,692 | 20,886,206 | 1.9% |
| Hanson | 328,950,735 | 4,890,431 | 1.5% |
| Hutchinson | 696,050,432 | 10,651,549 | 1.5% |
| McCook | 557,638,631 | 9,402,415 | 1.7% |
| Yankton | 1,297,186,219 | 22,362,008 | 1.7% |
| Total | $16,183,499,350 | $266,602,632 | 1.6% |
| **Nebraska** | | | |
| Cedar | $1,217,786,465 | $18,784,733 | 1.5% |
| Wayne | 1,011,932,084 | 18,041,990 | 1.8% |
| Stanton | 690,161,712 | 12,537,059 | 1.8% |
| Platte | 3,556,501,878 | 55,577,378 | 1.6% |
| Colfax | 1,015,683,931 | 18,004,032 | 1.8% |
| Butler | 1,210,850,485 | 20,597,362 | 1.7% |
| Seward | 1,706,365,907 | 29,389,841 | 1.7% |
| Saline | 1,235,103,379 | 23,050,519 | 1.9% |
| Jefferson | 983,483,004 | 16,698,237 | 1.7% |
| Total | $12,627,868,845 | $212,681,151 | 1.7% |
| **Kansas** | | | |
| Butler | $3,906,384,545 | $88,195,610 | 2.3% |
| Clay | 436,830,884 | 10,846,974 | 2.5% |

# REFERENCES

*Note: Memo 13 source references are listed in Memo 13.*

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# APPENDIX P

# Crude Oil Material Safety Data Sheets

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## Section 1: PRODUCT AND COMPANY IDENTIFICATION

| | |
|---|---|
| **Product Name:** | Dilbit |
| **Synonyms:** | Diluted Bitumen; AWB – Access Western Blend; Pipeline Sales Oil. |
| **Product Use:** | Base product for Petroleum Refining. |
| **Manufacturer/Supplier:** | MEG Energy Corp.<br>Christina Lake Regional Project<br>P.O Box 21008<br>Fort McMurray, AB<br>T9H 5B2 |
| **Phone Number:** | 403-770-5596 |
| **Emergency Phone:** | MEG Emergency Number: 1-800-575-1400<br>FOR EMERGENCIES INVOLVING DANGEROUS GOODS Call CANUTEC's 24-hr Number: 613-996-6666 |
| **Date of Preparation:** | August 31, 2011 |

## Section 2: HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW**
DANGER
HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES AND SKIN.

| | |
|---|---|
| **Colour:** | Light to dark brown. |
| **Physical State:** | Liquid. |
| **Odour:** | Hydrocarbon. |

| WHMIS | Personal Protection Equipment | TDG (Ground) |
|---|---|---|
|  |  |  |

**Potential Health Effects:** See Section 11 for more information.

**Likely Routes of Exposure:** Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

**Eye:** Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm $H_2S$, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

**Skin:** Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

**Ingestion:** Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

**Inhalation:** May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

**Chronic Effects:** See Section 11 for more information.

**Medical Conditions Aggravated By Exposure:** Not available.

**Target Organs:** Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Reproductive system. Nervous system.

**Potential Environmental Effects:** See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

## Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

| Component | CAS No. | Wt. % |
|---|---|---|
| Petroleum | 8002-05-9 | 60 - 100 |
| Hexane | 110-54-3 | 5 - 10 |
| Benzene | 71-43-2 | 1 - 5 |
| Toluene | 108-88-3 | 1 - 5 |
| Xylenes | 1330-20-7 | 0.5 - 1.5 |
| Benzene, ethyl- | 100-41-4 | 0.1 - 1 |
| Hydrogen sulfide (H2S) | 7783-06-4 | < 0.1 |

## Section 4: FIRST AID MEASURES

**Eye Contact:** Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

**Skin Contact:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

**Ingestion:** Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Inhalation:** Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

**General Advice:** In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

**Note to Physicians:** Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

## Section 5: FIRE FIGHTING MEASURES

**Flammability:** Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

**Means of Extinction**
**Suitable Extinguishing Media:** Dry chemical, foam, water fog, carbon dioxide.

**Unsuitable Extinguishing Media:** Do not use water except as a fog.

**Products of Combustion:** Oxides of carbon. Oxides of sulphur. Aldehydes.

**Protection of Firefighters:** Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces.

**Explosion Data**
**Sensitivity to Mechanical Impact:** This material is not sensitive to mechanical impact.
**Sensitivity to Static Discharge:** This material is sensitive to static discharge at temperatures above the flash point.

## Section 6: ACCIDENTAL RELEASE MEASURES

**Personal Precautions:** Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Don full-face, positive pressure, self-contained breathing apparatus.

**Environmental Precautions:** Keep out of drains, sewers, ditches, and waterways.

**Methods for Containment:** Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

**Methods for Clean-Up:** Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

**Other Information:** Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

## Section 7: HANDLING AND STORAGE

**Handling:**
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. Harmful concentrations of hydrogen sulfide ($H_2S$) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

**Storage:**
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

## Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure Guidelines**
**Component**

Petroleum

(8002-05-9) **ACGIH:** Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined

(8002-05-9) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);
400 ppm (TWA) [Vacated]

Hexane

(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)

(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.
50 ppm (TWA) [Vacated]

Benzene

(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

Toluene

(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)

(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated]

Xylenes

(1330-20-7) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

(1330-20-7) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated]

Benzene, ethyl-

(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)

(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated]

Hydrogen sulfide (H2S)

(7783-06-4) **ACGIH:** 1 ppm (TWA); 5 ppm (STEL); (2009)

(7783-06-4) **OSHA:** 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated]

**PEL:** Permissible Exposure Limit
**TLV:** Threshold Limit Value
**TWA:** Time-Weighted Average
**STEL:** Short-Term Exposure Limit
**C:** Ceiling

**Engineering Controls:** Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

**Personal Protective Equipment**

**Eye/Face Protection:** Wear safety glasses. Ensure that eyewash stations are close to the workstation location.

| | |
|---|---|
| **Hand Protection:** | Wear impervious gloves. Consult manufacturer specifications for further information. |
| **Skin and Body Protection:** | Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled. |
| **Respiratory Protection:** | If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators. |
| **General Hygiene Considerations:** | Handle according to established industrial hygiene and safety practices. |

## Section 9: PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Appearance:** | Viscous liquid. |
| **Colour:** | Light to dark brown. |
| **Odour:** | Hydrocarbon. |
| **Odour Threshold:** | 0.00047 ppm, ($H_2S$) |
| **Physical State:** | Liquid. |
| **pH:** | Not available. |
| **Viscosity:** | 60.7 cSt @ 40 °C |
| **Melting Point:** | Not available. |
| **Boiling Point:** | 34.9 °C to 720 °C |
| **Flash Point:** | Not available. |
| **Evaporation Rate:** | Not available. |
| **Lower Flammability Limit:** | Not available. |
| **Upper Flammability Limit:** | Not available. |
| **Vapor Pressure:** | Not available. |
| **Vapor Density:** | > 1 (Air = 1) |
| **Specific Gravity:** | 0.9178 (Water = 1) @ 15 °C |
| **Density:** | 917.0 kg/m$^3$ @ 15 °C |
| **Solubility in Water:** | Insoluble. |
| **Coefficient of Water/Oil Distribution:** | Not measurable. Product is more soluble in oil. |
| **Auto-ignition Temperature:** | Not available. |
| **Percent Volatile, wt. %:** | Non-volatile. |
| **VOC content, wt. %:** | Not available. |

## Section 10: STABILITY AND REACTIVITY

**Stability:** Stable under normal storage conditions.

**Conditions of Reactivity:** Contact with incompatible materials. Sources of ignition. Exposure to heat.

**Incompatible Materials:** Strong oxidizers.

**Hazardous Decomposition Products:** Not available.

**Possibility of Hazardous Reactions:** None known.

## Section 11: TOXICOLOGICAL INFORMATION

### EFFECTS OF ACUTE EXPOSURE

**Component Toxicity**

| Component | CAS No. | $LD_{50}$ oral | $LD_{50}$ dermal | $LC_{50}$ |
|---|---|---|---|---|
| Petroleum | 8002-05-9 | 4300 mg/kg, (rat) | Not available. | Not available. |
| Hexane | 110-54-3 | 25000 mg/kg, (rat) | Not available. | 48000 ppm, (rat), 4H |
| Benzene | 71-43-2 | 930 mg/kg, (rat) | >9400 µl/kg, (rabbit) | 10000 ppm, (rat), 7H |
| Toluene | 108-88-3 | 600 mg/kg, (rat) | 14.1 mL/kg, (rabbit) | 49000 mg/m³, 4H, (rat) |
| Xylenes | 1330-20-7 | >1700 mg/kg, (rat) | 4300 mg/kg, (rabbit) | 5000 ppm, (rat), 4H |
| Benzene, ethyl- | 100-41-4 | 3500 mg/kg, (rat) | 17800 µl/kg, (rabbit) | Not available. |
| Hydrogen sulfide (H2S) | 7783-06-4 | Not available. | Not available. | 444 ppm, (rat), |

**Eye:** Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

**Skin:** Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

**Ingestion:** Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

**Inhalation:** May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

**Skin Sensitization:** Not hazardous by OSHA/WHMIS criteria.

**Respiratory Sensitization:** Not hazardous by OSHA/WHMIS criteria.

### EFFECTS OF CHRONIC EXPOSURE

**Target Organs:** Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

**Chronic Effects:** Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects. Long term inhalation of Benzene, Toluene or Xylene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities. Immunodepressive effects have also been reported. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

**Carcinogenicity:** Hazardous by OSHA/WHMIS criteria. May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

**Component Carcinogenicity**

| **Component** | **ACGIH** | **IARC** | **NTP** | **OSHA** | **Prop 65** |
|---|---|---|---|---|---|
| Petroleum | A2 | Group 3 | Not listed. | Not listed. | Not listed. |
| Hexane | Not listed. | Not listed. | Not listed. | Not listed. | Not listed. |
| Benzene | A1 | Group 1 | List 1 | OSHA Carcinogen | Listed. |
| Toluene | A4 | Group 3 | Not listed. | Not listed. | Not listed. |
| Xylenes | A4 | Group 3 | Not listed. | Not listed. | Not listed. |
| Benzene, ethyl- | A3 | Group 2B | Not listed. | OSHA Carcinogen | Listed. |
| Hydrogen sulfide (H2S) | Not listed. | Not listed. | Not listed. | Not listed. | Not listed. |

**Mutagenicity:** Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

**Reproductive Effects:** Possible risk of impaired fertility. Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

**Developmental Effects**

**Teratogenicity:** Not hazardous by OSHA/WHMIS criteria.

**Embryotoxicity:** Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

**Toxicologically Synergistic Materials:** Not available.

## Section 12: ECOLOGICAL INFORMATION

**Ecotoxicity:** 21 and 41 mg/l, 96 hr., Rainbow trout;
2.7 and 4.1 mg/l, 96 hr., Mysid;
122 and 528 ml/kg, 96 hr., Algae.

**Persistence / Degradability:** Not available.

**Bioaccumulation / Accumulation:** Not available.

**Mobility in Environment:** Not available.

## Section 13: DISPOSAL CONSIDERATIONS

**Disposal Instructions:** Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

## Section 14: TRANSPORTATION INFORMATION

**CFR**
**Proper Shipping Name:** PETROLEUM CRUDE OIL, 3, UN 1267, I

**Class:** 3

**UN Number:** 1267

**Packing Group:** I

**Label Code:**

**TDG**
**Proper Shipping Name:** PETROLEUM CRUDE OIL, 3, UN 1267, I

**Class:** 3

**UN Number:** 1267

**Packing Group:** I

**Label Code:**

## Section 15: REGULATORY INFORMATION

**Chemical Inventories**

**US (TSCA)**
The components of this product are in compliance with the chemical notification requirements of TSCA.

**Canada (DSL)**
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

## Federal Regulations

### Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

**WHMIS Classification:**

Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

**Hazard Symbols:**

### United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**SARA Title III**

| Component | Section 302 (EHS) TPQ (lbs.) | Section 304 EHS RQ (lbs.) | CERCLA RQ (lbs.) | Section 313 | RCRA CODE | CAA 112( r ) TQ (lbs.) |
|---|---|---|---|---|---|---|
| Petroleum | Not listed. | Not listed. | Not listed. | Not listed. | Not listed. | Not listed. |
| Hexane | Not listed. | Not listed. | 5000 | 313 & X | Not listed. | Not listed. |
| Benzene | Not listed. | Not listed. | 10 | 313 | U019 | Not listed. |
| Toluene | Not listed. | Not listed. | 1000 | 313 | U220 | Not listed. |
| Xylenes | Not listed. | Not listed. | 100 | 313 | U239 | Not listed. |
| Benzene, ethyl- | Not listed. | Not listed. | 1000 | 313 | Not listed. | Not listed. |
| Hydrogen sulfide (H2S) | 500 | 100 | 100 | 313s | U135 | 10000 |

### State Regulations

**Massachusetts**

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

| Component | CAS No. | RTK List |
|---|---|---|
| Petroleum | 8002-05-9 | Listed. |
| Hexane | 110-54-3 | Listed. |
| Benzene | 71-43-2 | E |
| Toluene | 108-88-3 | Listed. |
| Xylenes | 1330-20-7 | Listed. |
| Benzene, ethyl- | 100-41-4 | Listed. |
| Hydrogen sulfide (H2S) | 7783-06-4 | E |

**Note:** E = Extraordinarily Hazardous Substance

**New Jersey**

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

| Component | CAS No. | RTK List |
|---|---|---|
| Petroleum | 8002-05-9 | SHHS |
| Hexane | 110-54-3 | SHHS |
| Benzene | 71-43-2 | SHHS |
| Toluene | 108-88-3 | SHHS |
| Xylenes | 1330-20-7 | SHHS |
| Benzene, ethyl- | 100-41-4 | SHHS |
| Hydrogen sulfide (H2S) | 7783-06-4 | SHHS |

**Note:** SHHS = Special Health Hazard Substance

**Pennsylvania**

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

| Component | CAS No. | RTK List |
|---|---|---|
| Petroleum | 8002-05-9 | Listed. |
| Hexane | 110-54-3 | Listed. |
| Benzene | 71-43-2 | ES |
| Toluene | 108-88-3 | E |
| Xylenes | 1330-20-7 | E |
| Benzene, ethyl- | 100-41-4 | E |
| Hydrogen sulfide (H2S) | 7783-06-4 | E |

**Note:** E = Environmental Hazard; S = Special Hazardous Substance

**California**

**California Prop 65:** WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

| Component | Type of Toxicity |
|---|---|
| Benzene | developmental, male & cancer |
| Toluene | developmental & female |
| Benzene, ethyl- | cancer |
| Polycyclic Aromatic Hydrocarbons | cancer |
| Nickel | cancer |

## Section 16: OTHER INFORMATION

**Disclaimer:**

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

**Expiry Date:** August 30, 2014

**Version:** 1.0

**MSDS Prepared by:** **Deerfoot Consulting Inc.**

**Phone: (403) 720-3700**

**Nebraska Department of Environmental Quality 20.0---AMENDED**

**Reference:** Nebraska Supplement Environmental Report

**ER Section: Appendix N, Crude Oil Fact Sheets**

**Comment:**

A wide range of percentages is presented for xylene in Appendix N.

**Requested Information:**

Verify the range of values presented in Appendix N for percentage of xylene in light and heavy crude oils.

**Response:** AMENDED RESPONSE:

The Fact Sheet data has been reviewed and subsequently revised to show a xylene range of 0.1% to a maximum of 1.5% for both light and heavy crude oils. A copy of the revised Fact Sheets is attached.

Response provided by: Sandra Barnett, TransCanada

TransCanada Keystone Pipeline LP

# Light Oil MSDS

TransCanada
In business to deliver

## 1. Product and Company Identification

**Product Name:** Typical Light Oil

**Synonyms:** Not Available

**Intended Use:** Chemical feedstock

**Chemical Family:** Blend of Medium Crude and Synthetic Crude

**Supplier:** TransCanada Keystone Pipeline LP
450 – First Street S.W.,
P.O. Box 1000, Station M Calgary, Alberta, CANADA, T2P 4K6

**Emergency Phone:** **1-800-982-7222 (24 Hour)**

## 2. Composition/Information on Ingredients

**Hazardous Ingredients:**

| Name | CAS# | TWA (ppm) | TWA (Mg/M³) | Exposure Limits STEL (ppm) | STEL (Mg/M³) | CEIL (ppm) | CEIL (Mg/M³) | % by Weight |
|---|---|---|---|---|---|---|---|---|
| Crude Oil (Hydrocarbon C5 and C6 Rich) | 8002-05-09 | 100 | n/av | n/av | n/av | n/av | n/av | 100 |
| Hydrogen Sulfide | 7783-06-04 | 10 | 14 | 15 | 21 | 20 | 28 | <0.5 |
| Benzene | 71-43-2 | | 3.2 | | 16 | | | 0.1-1.0 |
| Toluene | 108-88-3 | 50 | 188 | | | | | 1-5 |
| Xylene | 1330-20-7 | | | | | | | 0.1-1.5 |

**Toxicity values of the hazardous ingredients**

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide ($H_2S$) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat = 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat = 4300 mg/Kg. LC50 Inhalation rat = 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat = 5000 mg/Kg. LC50 Inhalation rat = 8000 ppm for n4 hrs. LD50 Dermal rabbit = 14000 mg/Kg.

## 3. First Aid Measures

**Eye:** Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.

**Skin:** Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention ifirritation develops.

**Inhalation (Breathing):** Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.

**Ingestion (Swallowing):** If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

## 4. Protective Clothing

**Respiratory:** Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

**Skin:** Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

**Eye:** Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

**Other:** As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.

## 5. Physical Data

| | |
|---|---|
| **Appearance:** | Amber to Black |
| **Physical State:** | Liquid |
| **Odour:** | Petroleum Odor |
| **Vapor Pressure (mm Hg):** | 155 - 620 |
| **Vapor Density:** | >1 |
| **Boiling Point/Range:** | -90°C - 1100°C |
| **Freezing/Melting Point:** | Not Available |
| **Solubility in Water:** | Not Available |
| **Specific Gravity:** | 0.82-0.90 (Water =1) |
| **Percent Volatile:** | 100 vol.% |
| **pH (1% soln/water)** | Not Applicable |
| **Odor Threshold** | 0.13 ppm H2S |
| **Freezing Point** | Not Available |
| **Molecular Weight** | Not Applicable |
| **Melting Point** | Not available |
| **Density (kg/m$^3$)** | 820-900 |
| **Evaporation Rate (nButAc=1):** | Not Available |

## 6. Stability and Reactivity

**Stability:** This product is stable

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.

**Hazardous Polymerization:** Will not occur

**Materials to Avoid (Incompatible Materials):** Strong acids, strong oxidizers, chlorine.

## 7. Toxicological Information

**Routes of entry:** Ingestion, inhalation, eye contact, skin contact.

**TLV:** TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH.
Hydrogen Sulfide:
TWA: 10ppm, 14 mg/m3 ACGIH
STEL: 2.5 ppm STEL ACGIH
CEILING: 20 ppm, 28 mg/m3 Alberta OEL
Consult local authorities for acceptable exposure limits. Consult local authorities for acceptable exposure limits.
Benzene. TWA: (1ppm 3.2 mg/m3) STEL: 5.0 ppm (16 mg/m)$^3$) from Alberta OEL's SKIN
ACGIH (TLV) (United States) TWA 0.5 ppm. STEL 2.5 ppm (SKIN)

**Toxicity to animals:** Hydrocarbons C5 and C6 Rich
LD50: Not available
LC50: Not available
Hydrogen Sulphide (H2S)
LC50 Inhalation Mouse = 673 ppm 1 hour
LC50 Inhalation RAT = 444ppm for 4 hours
**Remark:** No additional remark

**Chronic effects:** This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficient evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has fetotoxic effects in animal studies. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.
**Remark:** No additional remark

**Acute effects:** Sensitizing Capability: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.

**Ingestion:** Pulmonary aspiration hazard if swallowed and vomiting occurs.

**Skin:** Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.

**Eyes:** Eye contact with product or product vapours may result in eye irritation.

**Inhalation:** May cause headache, dizziness, loss of appetite and loss of consciousness. Product vapours are irritating to the respiratory tract.
**Remark:** This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

**Synergistic:** Not available

## 8. Fire and Explosion

**Auto-ignition temperature:** Not available

**Flash points:** CLOSED CUP: -40°C (-40°F)

**Flammable Limits:** Not available

**Extinguishing Media:** Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool contained vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special fire fighting procedures:** Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.

**Flammability:** Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

**Risks of explosion:** This material is sensitive to static discharge. This product is not sensitive to mechanical impact.

## 9. Preventative Measures

**Waste Disposal:** Dispose of in accordance with all federal, provincial and local regulations.

**Storage:** Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.

**Ventilation:** Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

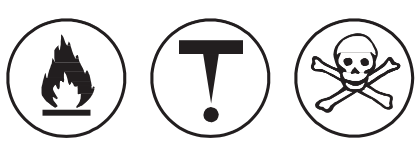
**Spill and Leak:** Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

## 10. Classification/Regulatory Information

**TDG road/rail:** TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5°C (140.9°F).
Closed cup tes method.


**PIN:** 1267 - PETROLEUM CRUDE OIL

**WHMIS:** WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).



**Other:** This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.

**Refer to federal, state, and local legislation for further requirements.**

TransCanada Keystone Pipeline LP

# Heavy Oil MSDS

TransCanada
*In business to deliver*

## 1. Product and Company Identification

**Product Name:** Typical Heavy Oil

**Synonyms:** Not Available

**Intended Use:** Chemical feedstock

**Chemical Family:** Blend of Heavy Petroleum Crude, Medium Crude and Synthetic Crude

**Supplier:** TransCanada Keystone Pipeline LP
450 – First Street S.W.,
P.O. Box 1000, Station M Calgary, Alberta, CANADA, T2P 4K6

**Emergency Phone:** **1-800-982-7222 (24 Hour)**

## 2. Composition/Information on Ingredients

**Hazardous Ingredients:**

| Name | CAS# | TWA (ppm) | TWA (Mg/M³) | Exposure Limits STEL (ppm) | STEL (Mg/M³) | CEIL (ppm) | CEIL (Mg/M³) | % by Weight |
|---|---|---|---|---|---|---|---|---|
| Crude Oil (Hydrocarbon C5 and C6 Rich) | 8002-05-09 | 100 | n/av | n/av | n/av | n/av | n/av | 100 |
| Hydrogen Sulfide | 7783-06-04 | 10 | 14 | 15 | 21 | 20 | 28 | <0.5 |
| Benzene | 71-43-2 | | 3.2 | | 16 | | | 0.05-1.0 |
| Toluene | 108-88-3 | 50 | 188 | | | | | 1-5 |
| Xylene | 1330-20-7 | | | | | | | 0.1-1.5 |

**Toxicity values of the hazardous ingredients**

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide ($H_2S$) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat = 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat = 4300 mg/Kg. LC50 Inhalation rat = 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat = 5000 mg/Kg. LC50 Inhalation rat = 8000 ppm for n4 hrs. LD50 Dermal rabbit = 14000 mg/Kg.

## 3. First Aid Measures

**Eye:** Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.

**Skin:** Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention ifirritation develops.

**Inhalation (Breathing):** Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.

**Ingestion (Swallowing):** If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

## 4. Protective Clothing

**Respiratory:** Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

**Skin:** Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

**Eye:** Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

**Other:** As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.

## 5. Physical Data

| | |
|---|---|
| **Appearance:** | Black Brown |
| **Physical State:** | Liquid |
| **Odour:** | Petroleum Odor |
| **Vapor Pressure (mm Hg):** | 155 - 520 |
| **Vapor Density:** | 2.5 - 5.0 |
| **Boiling Point/Range:** | 10°C - 1000°C |
| **Freezing/Melting Point:** | Not Available |
| **Solubility in Water:** | Not Available |
| **Specific Gravity:** | 0.92-0.94 (Water =1) |
| **Percent Volatile:** | 100 vol.% |
| **pH (1% soln/water)** | Not Applicable |
| **Odor Threshold** | 0.13 ppm H2S |
| **Freezing Point** | Not Available |
| **Molecular Weight** | Not Applicable |
| **Melting Point** | Not available |
| **Density (kg/m$^3$)** | 920-940 |
| **Evaporation Rate (nButAc=1):** | Not Available |

## 6. Stability and Reactivity

**Stability:** This product is stable

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.

**Hazardous Polymerization:** Will not occur

**Materials to Avoid (Incompatible Materials):** Strong acids, strong oxidizers, chlorine.

## 7. Toxicological Information

**Routes of entry:** Ingestion, inhalation, eye contact, skin contact.

**TLV:** TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH.
Hydrogen Sulfide:
TWA: 10ppm, 14 g/m3 ACGIH
STEL: 2.5 ppm STEL ACGIH
CEILING: 20 ppm, 28 mg/m3 Alberta OEL
Consult local authorities for acceptable exposure limits. Consult local authorities for acceptable exposure limits.
Benzene. TWA: (1ppm 3.2 mg/m3) STEL: 5.0 ppm (16 mg/m)$^{3}$) from Alberta OEL's SKIN
ACGIH (TLV) (United States) TWA 0.5 ppm. STEL 2.5 ppm (SKIN)

**Toxicity to animals:** Hydrocarbons C5 and C6 Rich
LD50: Not available
LC50: Not available
Hydrogen Sulphide (H2S)
LC50 Inhalation Mouse = 673 ppm 1 hour
LC50 Inhalation RAT = 444ppm for 4 hours
**Remark:** No additional remark

**Chronic effects:** This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficient evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has fetotoxic effects in animal studies. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.
**Remark:** No additional remark

**Acute effects:** Sensitizing Capability: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.

**Ingestion:** Pulmonary aspiration hazard if swallowed and vomiting occurs.

**Skin:** Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.

**Eyes:** Eye contact with product or product vapours may result in eye irritation.

**Inhalation:** May cause headache, dizziness, loss of appetite and loss of consciousness. Product vapours are irritating to the respiratory tract.
**Remark:** This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

**Synergistic:** Not available

## 8. Fire and Explosion

**Auto-ignition temperature:** Not available

**Flash points:** CLOSED CUP: -40°C (-40°F)

**Flammable Limits:** Not available

**Extinguishing Media:** Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool contained vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special fire fighting procedures:** Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.

**Flammability:** Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

**Risks of explosion:** This material is sensitive to static discharge. This product is not sensitive to mechanical impact.

## 9. Preventative Measures

**Waste Disposal:** Dispose of in accordance with all federal, provincial and local regulations.

**Storage:** Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.

**Ventilation:** Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

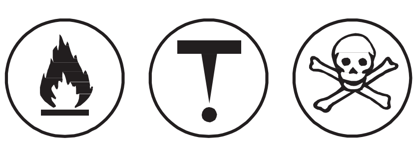
**Spill and Leak:** Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

## 10. Classification/Regulatory Information

**TDG road/rail:** TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5°C (140.9°F).
Closed cup tes method.


**PIN:** 1267 - PETROLEUM CRUDE OIL

**WHMIS:** WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).



**Other:** This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.

**Refer to federal, state, and local legislation for further requirements.**

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# APPENDIX Q

## Pipeline Risk Assessment and Environmental Consequence Analysis

*Note: Appendix B is Privileged and Confidential and is not included with the Supplemental EIS.*

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# Keystone XL Project
# Pipeline Risk Assessment and Environmental Consequence Analysis

**PRIVILEGED AND CONFIDENTIAL MATERIAL**

July 6, 2009

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# 1.0 Project Overview

TransCanada Keystone Pipeline, LP (Keystone) proposes to construct and operate a crude oil pipeline and related facilities from Hardisty, Alberta, Canada to the Port Arthur and east Houston areas of Texas in the United States (US). The project, known as the Keystone XL Project (Project), will have a nominal capacity to deliver up to 900,000 barrels per day (bpd) of crude oil from an oil supply hub near Hardisty to existing terminals in Nederland near Port Arthur and Moore Junction in Houston, Texas. The Steele City Segment extends from Hardisty, Alberta, southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma, south to Nederland, Texas. The Houston Lateral extends from the Gulf Coast Segment, Liberty County, Texas, southwest to Moore Junction, Harris County, Texas. See the proposed Project route in **Figure 1-1**.


**Figure 1-1 Overview of the Project**

In total, the Project will construct approximately 1,707 miles of new, 36-inch-diameter pipeline, consisting of about 327 miles in Canada and 1,375 miles within the US. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension segment of the Keystone Pipeline Project (Keystone Cushing Extension). The Project proposes to transport up to 900,000 barrels of crude oil per day. This proposed volume would be 309,000 barrels greater than the rate of

591,000 barrels per day that was analyzed for the Keystone Cushing Extension in the previous Keystone Pipeline permitting process, completed in 2008. Spill risk and potential environmental consequences described in this Risk Assessment are based on transportation of up to 900,000 barrels per day through all Project pipeline segments within the U.S. Because of this increase in throughput volume, the Keystone Cushing Extension is included as part of the overall Keystone XL Project for spill risk analysis purposes.

## 1.1 Federal Permitting Process

The Project will require the issuance of a Presidential Permit by the US Department of State (DOS) to cross the US/Canada border. The proposed route also crosses federal lands managed by the Bureau of Land Management (BLM) that will require the issuance of a right-of-way (ROW) grant. The issuance of the Presidential Permit and a ROW grant across federal lands are considered federal actions and, therefore, the Project is subject to environmental review pursuant to the National Environmental Policy Act (NEPA) (42 United States Code § 4321 et seq.). The DOS is the lead federal agency for NEPA compliance, with the BLM participating as a cooperating agency.

In September 2008, Keystone submitted a Presidential Permit application to the DOS, accompanied by a preliminary Environmental Report. In November 2008, Keystone submitted a comprehensive Environmental Report to the DOS. Contemporaneous with this Pipeline Risk Assessment and Environmental Consequence Analysis (Risk Assessment), Keystone is submitting a Supplemental Environmental Report to the DOS. The Environmental Report, as supplemented, includes an objective disclosure of beneficial and adverse environmental impacts resulting from the Project, as well as a set of reasonable alternatives. This Risk Assessment supplements the information in the Environmental Report, as supplemented, disclosing potential environmental consequences that might occur in the unlikely event of a crude oil release from the Project.

# 2.0 Introduction

This Risk Assessment presents the results of a pipeline incident frequency and spill volume analysis based on the Project's design and operations criteria and applies the resulting risk probabilities to an environmental consequence analysis that incorporates project-specific environmental data. Specifically, this Risk Assessment evaluates the risk of crude oil spills during pipeline operations, including contribution of natural hazards to spill risk and the subsequent potential effects on humans and other sensitive resources, particularly in areas of high environmental sensitivity, including federally designated high consequence areas (HCAs) (e.g., certain populated areas, designated zones around public drinking water intakes, and/or ecologically sensitive areas). Additional effects on public health and safety that could occur during Project construction are discussed under other resource sections (e.g., air quality, water resources, transportation, land use, and aesthetics) within the Environmental Report, as supplemented.

The purpose of this Risk Assessment is threefold. First, it provides a conservative range of anticipated effects from the operation of the Project that is sufficient for the purposes of NEPA. Second, the Risk Assessment provides a preliminary evaluation of potential risk during the pipeline's design phase, facilitating the early selection of possible valve locations. Third, this Risk Assessment provides Keystone with an initial basis for the development of emergency response planning and eventual incorporation of the Project into TransCanada's Integrity Management Program. Given these objectives, the analysis summarized within this Risk Assessment is intentionally conservative (i.e., overestimates risk). Keystone's expectation is that the spill frequencies and volumes presented in this analysis are not likely to occur, but are provided as a conservative framework to ensure agency decisions are based on knowledge of the potential range of effects, as well as allowing Keystone to prepare for the worst-case scenarios in its emergency response preparations as required by applicable federal regulations.

# 3.0 Incident Frequency-Spill Volume Study

A project-specific incident[1] frequency and spill volume analysis was conducted for the Project (**Appendix A**). This study assessed the US portion of the Project and estimated the frequency and volume of releases for five distinct and independent threats. The study is a quantitative assessment of spill potential for the entire pipeline utilizing publicly available historical incident data collected from Pipeline and Hazardous Materials Safety Administration (PHMSA) incident reports as adjusted to reflect Keystone project design and operational criteria, as well as adjustments to certain risk factors that are responsive to improvements in pipeline design, operation, and safety.

## 3.1 Incident Frequency

Keystone conducted a threat assessment, which identified five primary threats that could result in a release:

- Corrosion (external, internal, and stress corrosion cracking);
- Materials and construction (e.g., pipe steel flaws, defective welds);
- Accidental damage from third-party excavation;
- Incorrect pipeline operations; and
- Facility damage from natural hazards (e.g., landslides, floods).

These threats have been carefully analyzed taking into account Keystone's proprietary pipeline design and operation requirements. Major elements of Keystone's design and operational standards, which greatly reduce the threat of crude oil releases, include the following:

- Pipe specifications that meet or exceed applicable regulations;
- Use of the highest quality external pipe coatings (fusion bond epoxy or FBE) to prevent corrosion;
- Four feet of soil cover will be provided over the buried pipeline in most locations which exceeds federal standards;
- A variety of pipeline system inspection and testing programs will be implemented prior to operation to prevent leaks. Examples of these programs include: an extensive pipeline quality assurance program for pipe manufacturing and coating; non-destructive testing of 100 percent of girth welds; and hydrostatic testing of the pipeline at 125 percent of the Maximum Operating Pressure (MOP).
- An operational pipeline monitoring system (Supervisory Control and Data Acquisition [SCADA]) that remotely measures changes in pressure and volume every 5 seconds on a constant basis. These measurement data are immediately analyzed to determine potential product releases anywhere on the pipeline system.
- Periodic pipeline integrity inspection programs using internal inspection tools to detect pipeline diameter anomalies indicating excavation damage, and loss of wall thickness from corrosion.

[1] An "incident" refers to a variety of abnormal pipeline events that are reportable to the Pipeline and Hazardous Materials Safety Administration (PHMSA), including the release of oil greater than 5 gallons, and accident resulting in human injuries, fatalities, or property damage in excess of $50,000.

- Aboveground aerial and ground surveillance inspections. The aerial inspections will be conducted 26 times per year (not to exceed 3 weeks apart) to detect leaks and spills as early as possible, and to identify potential third-party activities that could damage the pipeline.

- Mainline valves and intermediate mainline valves and check valves installed along the pipeline route to reduce or avoid spill effects to PHMSA-defined HCAs.

The implementation of all these measures will ensure that the likelihood of spills to occur will be very small, and that the volume released, in the unlikely event of a spill, would be very small.

While future events cannot be known with absolute certainty, historic incident frequencies can be used to estimate the number of events that might occur over a period of time. Based on available PHMSA data, the spill frequency analysis produced a conservative incident frequency of 0.000135 incident per mile per year, equivalent to no more than 2.2 spills in 10 years for the 1,672 miles of the Project, including the Keystone Cushing Extension. For any 1-mile segment, this probability is equivalent to 1 spill every 7,400 years. **Table 3-1** shows the number of spills that might occur along the entire Project during 10 years of service.

**Table 3-1 Spill Occurrence Interval Associated with the Project over 10 Years**

| | **Conservative Number of Spills per 10 years** |
|---|---|
| Steele City Segment (850 miles) | 1.1 |
| Keystone Cushing Extension (298 miles) | 0.4 |
| Gulf Coast Segment and Houston Lateral (525 miles) | 0.6 |
| Total (1,672 miles) | 2.2 |

[1] Although the Keystone Cushing Extension has been previously permitted, it is included in this analysis since its nominal throughput has increased from 591,000 to 900,000 bpd.

PHMSA data show that the number of spills on crude oil pipelines has substantially declined in recent years with the implementation of US Department of Transportation's (USDOT) Integrity Management Rule. For the reasons listed above, Keystone expects that the actual number of incidents will be substantially lower than those estimated in this analysis.

## 3.2 Spill Volume

For this analysis, maximum spill volumes were determined for three spill scenarios (a complete rupture, a large leak, and a small leak) of the Keystone XL pipeline, accounting for maximum throughput, time to isolate the leak (detection and system shutdown), and subsequent draindown from the affected pipeline segment (**Appendix A**). While this analysis utilizes maximum spill volumes, actual incident data from the *Hazardous Liquid Pipeline Risk Assessment* (California State Fire Marshal 1993) indicate that spill volumes are significantly less than the maximum potential draindown volume. For example, in 50 percent of the cases, the actual spill volume represented less than 0.75 percent of the maximum potential draindown volume. In 75 percent of the cases, the actual spill volume represented less than 4.6 percent of the maximum draindown volume. Spill volumes are primarily controlled by mainline and intermediate mainline valves and check valve locations, the sensitivity of the Project leak detection and notification system, and the valve closure rates in the event of an incident. These pipeline detection and control systems are incorporated into the Project design, and represent the primary defenses for reducing spill volumes. Other procedures to reduce spill volume, by reducing draindown and depressurizing, are not estimated or included in the analysis. If these procedures were included, they most likely would significantly reduce the predicted maximum spill volumes estimated for the Project, if a spill were to occur.

PHMSA's incident database (2008) confirms that, maximum spill volumes estimated in this Risk Assessment are highly conservative (i.e., overstate risk). Examination of the current PHMSA dataset (2002 to present) indicates that the majority of actual pipeline spills are relatively small. Fifty percent of the spills consist of 3.0 barrels or less. In 85 percent of the cases, the spill volume was 100 barrels or less. In over 95 percent of the incidents, spill volumes were less than 1000 barrels. Oil spills of 10,000 barrels or larger occurred in 0.5 percent of cases. These data demonstrate that most pipeline spills are small and larger releases of 10,000 barrels or more are extremely uncommon. **Table 3-2** illustrates the frequencies that oil spills of different volumes are predicted to occur over a 10 year interval.

**Table 3-2 Spill Occurrence Interval Associated with the Project over 10 Years Breakdown by Volume**

| | **Conservative Number of Spills per 10 years** |
|---|---|
| Spill volume 3 barrels or less | 1.1 |
| Spill volume between 3 barrels and 100 barrels | 0.8 |
| Spill volume between 100 barrels and 1,000 barrels | 0.2 |
| Spill volume between 1,000 barrels and 10,000 barrels | 0.1 |
| Spill volume between greater than 10,000 barrels | 0.01 |
| Total Spills | 2.2 |

# 4.0 Consequences of a Spill

## 4.1 Human Consequences

The risk associated with the operation of the Project can be compared with the general risks encountered in everyday life. The National Center for Health Statistics (Center for Disease Control 2003) overall average annual death rate for the general population in the US is approximately 830 per 100,000. The USDOT reports the historical average risk to the general population per year associated with all hazardous liquids transmission pipelines is 0.004 in 100,000 (USDOT 2002). Therefore, the predicted risk of fatality to the public from incidents associated with the Project over and above the normal US death rate is very small.

## 4.2 Environmental Consequences

The environmental risk posed by a crude oil pipeline is a function of: 1) the probability of an accidental release; 2) the probability of a release reaching an environmental receptor (e.g., waterbody, fish); 3) the concentration of the contamination once it reaches the receptor; and 4) the hazard posed by that concentration of crude oil to the receptor. Based on spill probabilities and estimated spill volumes, this environmental assessment determines the probability of exposure to environmental receptors and the probable impacts based on a range of potential concentrations.

### 4.2.1 Crude Oil Composition

The composition of crude oil varies widely, depending on the source and processing. Crude oils are complex mixtures of hundreds of organic (and a few inorganic) compounds. These compounds differ in their solubility, toxicity, persistence, and other properties that profoundly affect their impact on the environment. The effects of a specific crude oil cannot be thoroughly understood without taking its composition into account.

The majority of the crude oil to be transported by the Project is expected to be derived from the Alberta oil sands region in Canada. The oil extracted from the oil sands is called bitumen, which is highly viscous. In order for the bitumen to be transported by pipeline, it is either mixed with a diluent and transported as diluted bitumen or upgraded to synthetic crude oil. The precise composition of diluted bitumen and synthetic crude oil will determined by shippers and is considered proprietary information. Diluted bitumen is similar to other crude oils derived from various locations throughout the world, such as portions of California, Venezuela, Nigeria, and Russia. For the purposes of this analysis, transportation of two crude oil types will be assumed: synthetic crude oil and diluted bitumen. This analysis assumes that the pipeline will contain segregated batches of these two products.

The primary classes of compounds found in crude oil are alkanes (hydrocarbon chains), cycloalkanes (hydrocarbons containing saturated carbon rings), and aromatics (hydrocarbons with unsaturated carbon rings). Most crude oils are more than 95 percent carbon and hydrogen, with small amounts of sulfur, nitrogen, oxygen, and traces of other elements. Crude oils contain lightweight straight-chained alkanes (e.g., hexane, heptane); cycloalkanes (e.g., cyclyohexane); aromatics (e.g., benzene, toluene); cycloalkanes; and heavy aromatic hydrocarbons (e.g., polycyclic aromatic hydrocarbons [PAHs], asphaltines). Straight-chained alkanes are more easily degraded in the environment than branched alkanes. Cycloalkanes are extremely resistant to biodegradation. Aromatics (i.e., benzene, toluene, ethylbenzene, xylenes compounds) pose the most potential for environmental concern. Because of their lower molecular weight they are more soluble in water than alkanes and cycloalkanes.

### 4.2.2 Environmental Fate and Transport

Overall, the environmental fate of crude oil is controlled by many factors and persistence is difficult to predict with great accuracy. The speed and efficiency of emergency response containment and cleanup largely dictates the fate and extent of transport within the environment. This section, however, discusses environmental fate and transport of crude oil, without accounting for the benefits of emergency response. Major factors affecting the environmental fate include spill volume, type of crude oil, dispersal rate of the crude oil, terrain, receiving media, and weather. Once released, the physical environment largely dictates the environmental persistence of the spilled material. Fate and transport of released crude oil are discussed by medium, and the primary degradation processes associated with each medium.

Soils

Overview. If released in soil at pipeline depth, the released oil can volatilize, sorb to soil particles, constituents can dissolve into the groundwater, or remain in residual form (Spence et al. 2001). The movement of crude oil, and the physical and chemical transformations of its constituents are influenced by a variety of factors and processes discussed below.

- Physical factors. The movement of crude oil across the soil surface is governed by slope, soil permeability, and, to a lesser extent, ambient temperature. Spreading across environmental surfaces reduces the bulk quantity of crude oil present in the immediate vicinity of the spill but increases the spatial area within which adverse effects may occur. Spreading and thinning of spilled crude oil in soils or water also increases the surface area of the slick, thus enhancing surface dependent fate processes such as evaporation, degradation, and dissolution.

- Evaporation. The majority of the volatile hydrocarbon fractions will evaporate quickly from pooled oil on the soil surface. Crude oil that has dispersed downward in the soil profile will evaporate more slowly because of less oil surface area exposed to the air, and the presence of other binding forces (see sorption below). The rates of evaporation are primarily controlled by soil porosity, and soil temperature.

- Sorption. Crude oil dispersed in soil will bind (adhere) to soil particles. Crude oil will usually bind most strongly with soil particles in organic soils; crude oil will usually bind less strongly with soil particles in sandy soils.

- Photodegradation. Photodegradation (breakdown of hydrocarbon molecules under exposure to sunlight) is an important process for soils directly exposed to sunlight at the soil surface. Crude oil that has penetrated deeper into the soil profile is not affected by this process.

- Biodegradation. With time, soil microorganisms capable of consuming crude oil generally increase in number and the biodegradation process naturally remediates the previously contaminated soil. The biodegradation process is enhanced as the surface area of spilled oil increases (e.g., by dispersion or spreading). Biodegradation has been shown to be an effective method of remediating soils and sediments contaminated by crude oil.

Water

Overview. If released into water, crude oil will float to the water's surface. If crude oil is left on the water's surface over an extended period of time, some constituents within the oil will evaporate, other fractions will dissolve, and, eventually, some material may descend to the bottom as sedimentation. The following is a summary of the major processes that occur during crude oil dispersion and degradation.

- Physical factors. Crude oil mobility in water increases with wind, stream velocity, and increasing temperature. Most crude oils move across surface waters at a rate of 100 to 300 meters per hour. Surface ice will greatly reduce the spreading rate of oil across a waterbody. Crude oil in flowing, as opposed to contained, waterbodies may cause transitory impacts. Although reduced in intensity, a crude oil spill into flowing waters tend to move over a much larger area.

- Dissolution. Dissolution of crude oil in water is not a significant process controlling the crude oil's fate in the environment, since most components of oils are relatively insoluble (Neff and Anderson 1981). Moreover, evaporation tends to dominate the reduction of crude oil, with dissolution slowly occurring with time. Overall solubility of crude oils tend to be less than their constituents since solubility is limited to the partitioning between oil and water interface and individual compounds are often more soluble in oil than in water, thus they tend to remain in the oil. Nevertheless, dissolution is one of the primary processes affecting the toxic effects of a spill, especially in confined waterbodies. Dissolution increases with decreasing molecular weight, increasing temperature, decreasing salinity, and increasing concentrations of dissolved organic matter. Greater photodegradation also tends to enhance the solubility of crude oil in water.

- Sorption. In water, heavy molecular weight hydrocarbons will bind to suspended particulates, and this process can be significant in highly turbid or eutrophic waters. Organic particles (e.g., biogenic material) in soils or suspended in water tend to be more effective at sorbing oils than inorganic particles (e.g., clays). Sorption processes and sedimentation reduce the quantity of heavy hydrocarbons present in the water column and available to aquatic organisms. However, these processes also render hydrocarbons less susceptible to degradation. Sedimented oil tends to be highly persistent and can cause shoreline impacts.

- Evaporation. Over time, evaporation is the primary mechanism of loss of low molecular weight constituents and light oil products. As lighter components evaporate, remaining crude oil becomes denser and more viscous. Evaporation tends to reduce crude oil toxicity but enhances crude oil persistence. In field trials, bulk evaporation of Alberta crude oil accounted for an almost 50 percent reduction in volume over a 12-day period, while the remaining oil was still sufficiently buoyant to float on the water's surface (Shiu et al. 1988). Evaporation increases with increased spreading of a slick, increased temperature, and increased wind and wave action.

- Photodegradation. Photodegradation of crude oil in aquatic systems increases with greater solar intensity. It can be a significant factor controlling the reduction of a slick, especially of lighter oil constituents, but it will be less important during cloudy days and winter months. Photodegraded crude oil constituents can be more soluble and more toxic than parent compounds. Extensive photodegradation, like dissolution, may thus increase the biological impacts of a spill event.

- Biodegradation. In the immediate aftermath of a crude oil spill, natural biodegradation of crude oil will not tend to be a significant process controlling the fate of spilled crude oil in environments previously unexposed to oil. Microbial populations must become established before biodegradation can proceed at any appreciable rate. Also, prior to weathering (i.e., evaporation and dissolution of light-end constituents), oils may be toxic to the very organisms responsible for biodegradation and high molecular weight constituents tend to be resistant to biodegradation. Biodegradation is nutrient and oxygen demanding and may be precluded in nutrient-poor aquatic systems. It also may deplete oxygen reserves in closed waterbodies, causing adverse secondary effects to aquatic organisms.

### 4.2.3 Environmental Impacts

An evaluation of the potential impacts resulting from the accidental release of crude oil into the environment is discussed by environmental resource below.

#### 4.2.3.1 Soils

Because pipelines are buried, soil absorption of spilled crude oil could occur, thus impacting the soils. Subsurface releases to soil tend to disperse slowly and are generally located within a contiguous and discrete area, often limited to the less consolidated soils (lower soil bulk density) within the pipeline trench. Effects to soils can be quite slow to develop, allowing time for emergency response and cleanup actions to mitigate effects to potential receptors.

In the event of a spill, a portion of the released materials would enter the surrounding soil and disperse both vertically and horizontally in the soil. The extent of dispersal would depend on a number of factors, including speed and success of emergency containment and cleanup, size and rate of release, topography of the release site, vegetative cover, soil moisture, bulk density, and soil porosity. High rates of release from the buried pipeline would result in a greater likelihood that released materials would escape the trench and reach the ground surface.

If a release were to occur in sandy soils encountered along the Project route, it is likely that the horizontal and vertical extent of the contamination would be greater than in areas containing more organic soils. Crude oil released into sandy soils would likely become visible to aerial surveillance due to product on the soils surface or discoloration of nearby vegetation, which will facilitate emergency response and soil remediation efforts. If present, soil moisture and moisture from precipitation would increase the dispersion and migration of crude oil.

The majority of the Project alignment is located in relatively flat or moderately rolling terrain. In these areas, the oil would generally begin dispersing horizontally within the pipeline trench, and with sufficient spill volume or flow, then the oil could move out of the trench onto the soils surface, generally moving toward low lying areas. If the spill were to occur on a steep slope where trench breakers had been installed during construction, then crude oil would pool primarily within the trench behind any trench breakers. If sufficient volume existed, the crude oil would breach the soil's surface as it extended over the top of the trench breaker. In either case, once on the soil's surface, the release would be more apparent to leak surveillance patrols, facilitating emergency response and remediation.

Both on the surface and in the subsurface, rapid attenuation of light, volatile constituents (due to evaporation) would quickly reduce the total volume of crude oil, while heavier constituents would be more persistent. Except in rare cases of high rate and high total volume releases with environmental settings characterized by steep topography or karst terrain, soil impacts would be confined to a relatively small, contiguous, and easily defined area, facilitating cleanup and remediation. Within a relatively short time, lateral migration would generally stabilize. Downward vertical migration would begin at the onset of a spill, with rates governed by soil permeability. For example, in soils with moderately high permeability, water may penetrate 2.5 inches per hour, while penetration rates for soils of low permeability may occur at 0.05 inch per hour. Crude oil is more viscous than water, therefore, permeability of crude oil would be slower.

In accordance with federal and state regulations, Keystone would be responsible for cleanup of contaminated soils and would be required to meet applicable cleanup levels. Soil cleanup levels for benzene from petroleum hydrocarbon releases vary by state (Montana: 0.04 part per million [ppm]; South Dakota: 17 ppm; Nebraska: 3.63 ppm; Kansas: 9.8 ppm; Oklahoma: no value; Texas: 38 ppm). While Oklahoma has no benzene soil cleanup standard, other risk-based screening values exist for petroleum hydrocarbons and, consequently, soils would still be remediated to ensure human health and environmental quality. Once remedial cleanup levels were achieved in the soils, no adverse or long-term impacts would be expected.

It is difficult to estimate the volume of soil that might be contaminated in the event of a spill. Site-specific environmental conditions (e.g., soil type, weather conditions) and release dynamics (e.g., leak rate, leak duration) would result in substantially different surface spreading and infiltration rates, which in turn, affect the final volume of affected soil to be remediated. Based on historical data (PHMSA 2008), soil remediation involved 100 cubic yards of soil or less at the majority of spill sites where soil contamination occurred, and only 3 percent of the spill sites required remediation of 10,000 cubic yards or more (PHMSA 2008).

### 4.2.3.2 Vegetation and Soil Ecosystems

Crude oil released to the soil's surface could potentially produce localized effects on plant populations. Terrestrial plants are much less sensitive to crude oil than aquatic species. The lowest toxicity threshold for terrestrial plants found in the US Environmental Protection Agency (USEPA) ECOTOX database (USEPA 2001) is 18.2 ppm for benzene, which is substantially higher than the 7.4 ppm threshold for aquatic species and the 0.005 ppm threshold for human drinking water. Similarly, available data from the USEPA database indicate that earthworms also are less sensitive than aquatic species (toxicity threshold was greater than 1,000 ppm). If concentrations were sufficiently high, however, crude oil in the root zone could harm respiration and nutrient uptake by individual plants and organisms.

While a release of crude oil could result in the contamination of soils (see Section 4.2.2.1, Soils), Keystone will be responsible for cleanup of contaminated soils. Once remedial cleanup levels were achieved in the soils, no adverse or long-term impacts to vegetation would be expected.

### 4.2.3.3 Wildlife

Spilled crude oil can affect organisms directly and indirectly. Direct effects include physical processes, such as oiling of feathers and fur, and toxicological effects, which can cause sickness or mortality. Indirect effects are less conspicuous and include habitat impacts, nutrient cycling disruptions, and alterations in ecosystem relationships. The magnitude of effects varies with multiple factors, the most significant of which include the amount of material released, the size of the spill dispersal area, the type of crude oil spilled, the species assemblage present, climate, and the spill response tactics employed.

Wildlife, especially birds and shoreline mammals, are typically among the most visibly affected organisms in any crude oil spill. Effects of crude oil can be differentiated into physical (mechanical) and toxicological (chemical) effects. Physical effects result from the actual coating of animals with crude oil, causing reductions in thermal insulative capacity and buoyancy of plumage (feathers) and pelage (fur).

Crude oil released to the environment may cause adverse biological effects on birds and mammals via inhalation or ingestion exposure. Ingestion of crude oil may occur when animals consume oil-contaminated food, drink oil-contaminated water, or orally consume crude oil during preening and grooming behaviors.

Potential adverse effects could result from direct acute exposure. Acute toxic effects include drying of the skin, irritation of mucous membranes, diarrhea, narcotic effects, and possible mortality. While releases of crude oil may have an immediate and direct effect on wildlife populations, the potential for physical and toxicological effects attenuates with time as the volume of material diminishes, leaving behind more persistent, less volatile, and less water-soluble compounds. Although many of these remaining compounds are toxic and potentially carcinogenic, they do not readily disperse in the environment and their bioavailability is low and, therefore, the potential for impacts is low.

Unlike aquatic organisms that frequently cannot avoid spills in their habitats, the behavioral responses of terrestrial wildlife may help reduce potential adverse effects. Many birds and mammals are mobile and generally will avoid oil-impacted areas and contaminated food (Sharp 1990; Stubblefield et al. 1995). In a few cases, such as cave-dwelling species, organisms that are obligate users of contaminated habitat may be exposed. However, most terrestrial species have alternative, unimpacted habitat available, as will often be the case with localized spills (in contrast to large-scale oil spills in marine systems), therefore, mortality of these species would be limited (Stubblefield et al. 1995).

Indirect environmental effects of spills can include reduction of suitable habitat or food supply. Primary producers (e.g., algae and plants) may experience an initial decrease in primary productivity due to physical effects and acute toxicity of the spill. However, these effects tend to be short-lived and a decreased food supply is not considered to be a major chronic stressor to herbivorous organisms after a spill. If mortality occurs to local invertebrate and wildlife populations, the ability of the population to recover will depend upon the size of the impact area and the ability of surrounding populations to repopulate the area.

#### 4.2.3.4 Water Resources

Crude oil could be released to water resources if the pipeline is breached or leaks occur. As part of project planning and in recognition of the environmental sensitivity of waterbodies, the Project routing process attempted to minimize the number waterbodies crossed, including groundwater aquifers. Furthermore, valves have been strategically located along the Project route to help reduce the amount of crude oil that could potentially spill into waterbodies, if such an event were to occur. The location of valves, spill containment measures, and implementing actions in the Project Emergency Response Plan would mitigate adverse effects to both surface water and groundwater.

<u>Groundwater</u>

Multiple groundwater aquifers underlie the proposed Project. Vulnerability of these aquifers is a function of the depth to groundwater and the permeability of the overlying soils. While routine operation of the Project would not affect groundwater, there is the possibility that a release could migrate through the overlying surface materials and enter a groundwater system.

In general, the potential for groundwater contamination following a spill would be more probable in locations where a release into or on the surface of soils has occurred:

- Where a relatively shallow water table is present (as opposed to locations where a deeper, confined aquifer system is present);
- Where soils with high permeability are present throughout the unsaturated zone; and
- Where, in cooperation with federal and state agencies, the PHMSA (in cooperation with the US Geological Service [USGS] and other federal and state agencies) has identified specific groundwater resources that are particularly vulnerable to contamination. These resources are designated by PHMSA as HCAs (Section 4.3.2).

Depending on soil properties, the depth to groundwater, and the amount of crude oil in the unsaturated zone, localized groundwater contamination can result from the presence of free crude oil and the migration of its dissolved constituents. Crude oil is less dense than water and would tend to form a floating pool after reaching the groundwater surface. Movement of crude oil is generally quite limited due to adherence with soil particles, groundwater flow rates, and natural attenuation (i.e., microbial degradation) (Freeze and Cherry 1979; Fetter 1993). Those compounds in the crude oil that are soluble in water will form a larger, dissolved "plume." This plume would tend to migrate laterally in the direction of groundwater flow. Movement of dissolved constituent typically extends for greater distances than movement of pure crude oil in the subsurface, but is still relatively limited. The flow velocity of dissolved constituents would be a function of the groundwater flow rate and natural attenuation, with the dissolved constituents migrating more slowly than groundwater.

Unlike chemicals with high environmental persistence (e.g., trichloroethylene, pesticides), the aerial extent of the dissolved constituents will stabilize over time due to natural attenuation processes. Natural biodegradation through metabolism by naturally occurring microorganisms is often an effective mechanism for reducing the volume of crude oil and its constituents. Natural attenuation will reduce most toxic compounds into non-toxic metabolic byproducts, typically carbon dioxide and water (Minnesota Pollution Control Agency 2005). Field investigations of more than 600 historical petroleum hydrocarbon release sites indicate the migration of dissolved constituents typically stabilize within several hundred feet of the crude oil source area (Newell and Conner 1998; USGS 1998). Over a longer period, the area of the contaminant plume may begin to reduce due to natural biodegradation. Removal of crude oil contamination will eliminate the source of dissolved constituents impacting the groundwater.

Most crude oil constituents are not water soluble. For those constituents that are water soluble (e.g., benzene) the dissolved concentration is not controlled by the amount of oil in contact with the water, but by the concentration of the specific constituent in the oil (Charbeneau et al. 2000; Charbeneau 2003; Freeze and Cherry 1979). Studies of 69 crude oils found that benzene was the only aromatic or PAH compound tested that is capable of exceeding groundwater protection values for drinking water (i.e., maximum contaminant levels [MCLs] or Water Health Based Limits) (Kerr et al. 1999 as cited in O'Reilly et al. 2001).

If exposure to humans or other important resources would be possible from a release into groundwater, then regulatory standards, such as drinking water criteria (MCL) would mandate the scope of remedial actions, timeframe for remediation activities, and cleanup levels. For human health protection, the national MCL is an enforceable standard established by the USEPA and is designed to protect long-term human health. The promulgated drinking water standards for humans vary by several orders of magnitude for crude oil constituents. Of the various crude oil constituents, benzene has the lowest national MCL at 0.005 ppm[2] and, therefore, it was used to evaluate impacts on drinking water supplies, whether from surface water or groundwater.

However, emergency response and remediation efforts have the potential for appreciable adverse environmental effects from construction/cleanup equipment. If no active remediation activities were undertaken, natural biodegradation and attenuation would ultimately allow a return to preexisting conditions in both soil and groundwater. Depending on the amount of crude oil reaching the groundwater and natural attenuation rates, this would likely require up to tens of years. Keystone will utilize the most appropriate cleanup procedure as determined in cooperation with the applicable federal and state agencies.

Flowing Surface Waters

This report evaluated impacts to downstream drinking water sources by comparing projected surface water benzene concentrations with the national MCL for benzene. Like other pipelines already in existence, the Project will cross hundreds of perennial, intermittent, and ephemeral streams. Rather than evaluate the risk to each waterbody crossed by the Project, this risk assessment evaluated categories of streams, based on the magnitude of streamflow and stream width. **Table 4-1** summarizes the stream categories used for the assessment and identifies several representative streams within these categories.

**Table 4-1 Stream Categories**

| | Streamflow (cubic feet per second [cfs]) | Top of Bank Stream Width (feet) | Representative Streams |
|---|---|---|---|
| Low Flow Stream | 10 – 100 | <50 | Many unnamed intermittent tributaries in all states crossed, Bear Creek (MT), South Branch Timber Creek (NE) |
| Lower Moderate Flow Stream | 100 – 1,000 | 50 – 500 | Upper Sevenmile Creek (MT), Lone Tree Creek (MT), Little Blue River (NE) |
| Upper Moderate Flow Stream | 1,000 – 10,000 | 500 – 1,000 | Yellowstone River (MT), White River (SD), Niobrara River (NE) |
| High Flow Stream | >10,000 | 1,000 – 2,500 | Missouri River (MT), Loup River (NE), Platte River (NE), Canadian River (OK), Red River (TX) |

[2] All affected states along the Project route use the national MCL value of 0.005 ppm.

The following extremely conservative assumptions were developed to over-estimate potential spill effects for planning purposes.

- The entire volume of a spill was released directly into a waterbody;
- Complete, instantaneous mixing occurred;
- The entire benzene content was solubilized into the water column.

Under the actual conditions of a crude oil release, the spill and mixing events outlined by these assumptions are not expected to occur at the very high levels described.

A 1-hour release period for the entire spill volume was assumed in order to maximize the product concentration in water. The estimated benzene concentrations were then compared with the human health drinking water MCL for benzene (**Tables 4-2** and **4-3**). Based on these ultra-conservative assumptions, results suggest that most spills that enter a waterbody could result in exceedence of the national MCL for benzene. Although the assumptions used are highly conservative and, thus, overestimate potential benzene water concentrations, the analysis indicates the need for rapid notification of managers of municipal water intakes downstream of a spill so that any potentially affected drinking water intakes could be closed to bypass river water containing crude oil.

In addition to evaluating a general-case spill to flowing water, the potential for impacts to any specific waterbody also were evaluated. To do this, the occurrence interval for a spill at any one representative stream within one of the four stream categories reflected in **Table 4-1** was calculated based on spill probabilities generated from the PHMSA database. To be conservative, a 500-foot buffer on either side of the river was added to the crossing widths identified in **Table 4-1**. The occurrence intervals shown on **Tables 4-2** and **4-3** indicate the chance of a spill occurring at any specific waterbody is very low. Conservative occurrence intervals for a spill at any representative stream within any of the stream categories ranged from about 22,000 years for a large waterbody to over 830,000 years for a small waterbody (less likely to occur in any single small waterbody than any single large waterbody). If any release did occur, it is likely that the total release volume of a spill likely would be 3 barrels or less based on PHMSA data for historical spill volumes.

In summary, while a release of crude oil directly into any given waterbody would likely cause an exceedence of drinking water standards under the conservative assumptions used in this analysis, the frequency of such an event would be very low. Nevertheless, streams and rivers with downstream drinking water intakes represent sensitive environmental resources and could be temporarily impacted by a crude oil release. Keystone's Emergency Response Plan contains provisions for protecting and mitigating potential impacts to drinking water.

<u>Aquatic Organisms</u>

The concentration of crude oil constituents in an actual spill would vary both temporally and spatially in surface water; however, localized toxicity could occur from virtually any size of crude oil spill. **Table 4-4** summarizes the acute toxicity values (USEPA 2000) of various crude oil hydrocarbons to a broad range of freshwater species. Acute toxicity refers to the death or complete immobility of an organism within a short period of exposure. The $LC_{50}$ is the concentration of a compound necessary to cause 50 percent mortality in laboratory test organisms. For aquatic biota, most acute $LC_{50}$ for monoaromatics range between 10 and 100 ppm. $LC_{50}$ for the polyaromatic naphthalene were generally between 1 and 10 ppm, while $LC_{50}$ values for anthracene were generally less than 1 ppm.

**Table 4-2 Comparison of Estimated Benzene Concentrations with the Benzene MCL Resulting from a Diluted Bitumen Spill**

| Streamflow | Benzene MCL (ppm) | Stream Flow Rate (cfs) | Product Released | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Very Small Spill: 3 barrels | | Small Spill: 50 barrels | | Moderate Spill: 1,000 barrels | | Large Spill: 10,000 barrels | |
| | | | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) |
| Low Flow Stream | 0.005 | 10 | **0.7** | **74,681** | **10.9** | **124,469** | **218** | **248,938** | **2175** | **829,792** |
| Lower Moderate Flow Stream | 0.005 | 100 | **0.07** | **52,277** | **1.1** | **87,128** | **21.8** | **174,256** | **218** | **580,854** |
| Upper Moderate Flow Stream | 0.005 | 1,000 | **0.007** | **39,208** | **0.1** | **65,346** | **2.2** | **130,692** | **21.8** | **435,641** |
| High Flow Stream | 0.005 | 10,000 | 0.0007 | 22,404 | **0.01** | **37,341** | **0.2** | **74,681** | **2.2** | **248,938** |

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes (**Appendix A**), which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated concentration is based on release of benzene into water over a 1-hour period with uniform mixing conditions.
- Concentrations are based on a 0.15 percent by weight benzene content of the transported material.
- Shading indicates estimated benzene concentrations that could exceed the benzene MCL of 0.005 ppm.
- Occurrence intervals are based on an overall predicted incident frequency of 0.000135 incident/mile*year (**Appendix A**), projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

**Table 4-3 Comparison of Estimated Benzene Concentrations with the Benzene MCL Resulting from a Synthetic Crude Spill**

| Streamflow | Benzene MCL (ppm) | Stream Flow Rate (cfs) | Product Released: Small spill: 3 barrels – Benzene Conc. (ppm) | Small spill: 3 barrels – Occurrence Interval (years) | Moderate spill: 50 barrels – Benzene Conc. (ppm) | Moderate spill: 50 barrels – Occurrence Interval (years) | Large spill: 1,000 barrels – Benzene Conc. (ppm) | Large spill: 1,000 barrels – Occurrence Interval (years) | Very Large spill: 10,000 barrels – Benzene Conc. (ppm) | Very Large spill: 10,000 barrels – Occurrence Interval (years) |
|---|---|---|---|---|---|---|---|---|---|---|
| Low Flow Stream | 0.005 | 10 | **0.2** | **74,681** | **3.6** | **124,469** | **72** | **248,938** | **725** | **829,792** |
| Lower Moderate Flow Stream | 0.005 | 100 | **0.02** | **52,277** | **0.4** | **87,128** | **7.2** | **174,256** | **72.5** | **580,854** |
| Upper Moderate Flow Stream | 0.005 | 1,000 | 0.002 | 39,208 | **0.04** | **65,346** | **0.7** | **130,692** | **7.2** | **435,641** |
| High Flow Stream | 0.005 | 10,000 | 0.0002 | 22,404 | 0.004 | 37,341 | **0.07** | **74,681** | **0.7** | **248,938** |

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes (**Appendix A**), which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated concentration is based on release of benzene into water over a 1-hour period with uniform mixing conditions.
- Concentrations are based on a 0.05 percent by weight benzene content of the transported material.
- Shading indicates estimated benzene concentrations that could exceed the MCL of 0.005 ppm.
- Occurrence intervals are based on an overall predicted incident frequency of 0.000135 incident/mile*year (**Appendix A**), projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

**Table 4-4** shows fish are among the most sensitive aquatic biota, while aquatic invertebrates generally have intermediate sensitivities, and algae and bacteria tend to be the least sensitive. Nevertheless, even when major fish kills have occurred as a result of oil spills, population recovery has been observed and long-term changes in fish abundance have not been reported. Benthic (bottom-dwelling) aquatic invertebrates tend to be more sensitive than algae, but are equally or less sensitive than fish. Planktonic (floating) species tend to be more sensitive than most benthic insects, crustaceans, and molluscs.

In aquatic environments, toxicity is a function of the concentration of a compound necessary to cause toxic effects combined with the compound's water solubility. For example, a compound may be highly toxic, but if it is not very soluble in water then its toxicity to aquatic biota is relatively low. The toxicity of crude oil is dependent of the toxicity of its constituents. As an example, **Table 4-5** summarizes the toxicity of various crude oil hydrocarbons to the water flea, *Daphnia magna*. This species of water flea is used as a standard test organism to determine acute and chronic responses to toxicants. The relative toxicity of decane is much lower than for benzene or ethylbenzene because of the comparatively low solubility of decane. Most investigators have concluded that the acute toxicity of crude oil is related to the concentrations of relatively lightweight aromatic constituents, particularly benzene.

While lightweight aromatics such as benzene tend to be water soluble and relatively toxic, they also are highly volatile. Thus, most or all of the lightweight hydrocarbons accidentally released into the environment evaporate, and the environmental persistence of this crude oil fraction tends to be low. High molecular weight aromatic compounds, including PAHs, are not very water-soluble and have a high affinity for organic material. Consequently, these compounds, if present, have limited bioavailability, which render them substantially less toxic than more water-soluble compounds (Neff 1979). Additionally, these compounds generally do not accumulate to any great extent because these compounds are rapidly metabolized (Lawrence and Weber 1984; West et al.1984). There are some indications, however, that prolonged exposure to elevated concentrations of these compounds may result in a higher incidence of growth abnormalities and hyperplastic diseases in aquatic organisms (Couch and Harshbarger 1985).

Significantly, some constituents in crude oil may have greater environmental persistence than lightweight compounds (e.g., benzene), but their limited bioavailability renders them substantially less toxic than other more soluble compounds. For example, aromatics with four or more rings are not acutely toxic at their limits of solubility (Muller 1987). Based on the combination of toxicity, solubility, and bioavailability, benzene was determined to dominate toxicity associated with potential crude oil spills.

**Table 4-6** summarizes chronic toxicity values (most frequently measured as reduced reproduction, growth, or weight) of benzene to freshwater biota. Chronic toxicity from other oil constituents may occur, however, if sufficient quantities of crude oil are continually released into the water to maintain elevated concentrations.

The potential impacts to aquatic organisms of various-sized spills to waterbodies were modeled assuming the benzene content within each type of crude oil completely dissolved in the water. The benzene concentration was predicted based on amount of crude oil spilled and streamflow. The estimated benzene concentrations were compared to conservative acute and chronic toxicity values for protection of aquatic organisms. For aquatic biota, the lowest acute and chronic toxicity thresholds for benzene are 7.4 ppm and 1.4 ppm, respectively, based on standardized trout toxicity tests (USEPA 2000). These toxicity threshold values are considered protective of acute and chronic effects to aquatic biota. Although trout are not found in many of the habitats crossed by the project, trout are among the most sensitive aquatic species and reliable acute and chronic trout toxicity data are available. Using trout toxicity thresholds, therefore, provides a conservative benchmark to screen for the potential for toxicity.

**Table 4-4 Acute Toxicity of Aromatic Hydrocarbons to Freshwater Organisms**

| Species | Toxicity Values (ppm) | | | | |
|---|---|---|---|---|---|
| | Benzene | Toluene | Xylenes | Naphthalene | Anthracene |
| Carp (*Cyprinus carpio*) | 40.4 | --- | 780 | --- | --- |
| Channel catfish (*Kctalurus*) | ---[1] | 240 | --- | --- | --- |
| Clarias catfish (*Clarias* sp.) | 425 | 26 | --- | --- | --- |
| Coho salmon (*Oncorhyncus kisutch*) | 100 | --- | --- | 2.6 | --- |
| Fathead minnow (*Pimephales*) | --- | 36 | 25 | 4.9 | 25 |
| Goldfish (*Carassius auratus*) | 34.4 | 23 | 24 | --- | --- |
| Guppy (*Poecilia reticulate*) | 56.8 | 41 | --- | --- | --- |
| Largemouth bass (*Micropterus*) | --- | --- | --- | 0.59 | --- |
| Medaka (*Oryzias* sp.) | 82.3 | 54 | --- | --- | --- |
| Mosquito fish (*Gambusia affinis*) | --- | 1,200 | --- | 150 | --- |
| Rainbow trout (*Oncorhyncus mykis)* | 7.4 | 8.9 | 8.2 | 3.4 | --- |
| Zebra fish (*Therapon iarbua*) | --- | 25 | 20 | --- | --- |
| Rotifer *(Brachionus calyciflorus)* | >1,000 | 110 | 250 | --- | --- |
| Midge *(Chironomus attenuatus)* | --- | --- | --- | 15 | --- |
| Midge *(Chironomus tentans)* | --- | --- | --- | 2.8 | --- |
| Zooplankton *(Daphnia magna)* | 30 | 41 | --- | 6.3 | 0.43 |
| Zooplankton *(Daphnia pulex)* | 111 | --- | --- | 9.2 | --- |
| Zooplankton *(Diaptomus forbesi)* | --- | 450 | 100 | 68 | --- |
| Amphipod *(Gammarus lacustris)* | --- | --- | 0.35 | --- | --- |
| Amphipod *(Gammarus minus)* | --- | --- | --- | 3.9 | --- |
| Snail *(Physa gyrina)* | --- | --- | --- | 5.0 | --- |
| Insect *(Somatochloa cingulata)* | --- | --- | --- | 1.0 | --- |
| *Chlorella vulgaris* | --- | 230 | --- | 25 | --- |
| *Microcystis aeruginosa* | --- | --- | --- | 0.85 | --- |
| *Nitzschia palea* | --- | --- | --- | 2.8 | --- |
| *Scenedesmus subspicatus* | --- | 130 | --- | --- | --- |
| *Selenastrum capricornutum* | 70 | 25 | 72 | 7.5 | --- |

[1] Indicates no value was available in the database.

Note: Data summarize conventional acute toxicity endpoints from USEPA's ECOTOX database. When several results were available for a given species, the geometric mean of the reported $LC_{50}$ values was calculated.

**Table 4-5 Acute Toxicity of Crude Oil Hydrocarbons to *Daphnia magna***

| Compound | 48-hr $LC_{50}$ (ppm) | Optimum Solubility (ppm) | Relative Toxicity |
|---|---|---|---|
| Hexane | 3.9 | 9.5 | 2.4 |
| Octane | 0.37 | 0.66 | 1.8 |
| Decane | 0.028 | 0.052 | 1.9 |
| Cyclohexane | 3.8 | 55 | 14.5 |
| methyl cyclohexane | 1.5 | 14 | 9.3 |
| Benzene | 9.2 | 1,800 | 195.6 |
| Toluene | 11.5 | 515 | 44.8 |
| Ethylbenzene | 2.1 | 152 | 72.4 |
| p-xylene | 8.5 | 185 | 21.8 |
| m-xylene | 9.6 | 162 | 16.9 |
| o-xylene | 3.2 | 175 | 54.7 |
| 1,2,4-trimethylbenzene | 3.6 | 57 | 15.8 |
| 1,3,5-trimethylbenzene | 6 | 97 | 16.2 |
| Cumene | 0.6 | 50 | 83.3 |
| 1,2,4,5-tetramethylbenzene | 0.47 | 3.5 | 7.4 |
| 1-methylnaphthalene | 1.4 | 28 | 20.0 |
| 2-methylnaphthalene | 1.8 | 32 | 17.8 |
| Biphenyl | 3.1 | 21 | 6.8 |
| Phenanthrene | 1.2 | 6.6 | 5.5 |
| Anthracene | 3 | 5.9 | 2.0 |
| 9-methylanthracene | 0.44 | 0.88 | 2.0 |
| Pyrene | 1.8 | 2.8 | 1.6 |

Note: The $LC_{50}$ is the concentration of a compound necessary to cause 50 percent mortality in laboratory test organisms within a predetermined time period (e.g., 48 hours) (USEPA 2000).

Relative toxicity = optimum solubility/$LC_{50}$.

**Table 4-6 Chronic Toxicity of Benzene to Freshwater Biota**

| Taxa | Test Species | Chronic Value (ppm) |
|---|---|---|
| Fish | Fathead minnow (*Pimephales promelas*) | 17.2 * |
| | Guppy (*Poecilia reticulata*) | 63 |
| | Coho salmon (*Oncorhynchus kitsutch*) | 1.4 |
| Amphibian | Leopard frog (*Rana pipens*) | 3.7 |
| Invertebrate | Zooplankton (*Daphnia* spp.) | >98 |
| Algae | Green algae (*Selenastrum capricornutum*) | 4.8 * |

Note: Test endpoint was mortality unless denoted with an asterisk (*). The test endpoint for these studies was growth.

**Tables 4-7** through **4-10** summarize a screening-level assessment of acute and chronic toxicity to aquatic resources. Broadly, acute toxicity could potentially occur if substantial amounts of crude oil were to enter rivers and streams. If such an event were to occur within a small stream, aquatic species in the immediate vicinity and downstream of the rupture could be killed or injured. Chronic toxicity also could potentially occur in small and moderate sized streams and rivers. However, emergency response, containment, and cleanup efforts would help reduce the concentrations and minimize the potential for chronic toxicity. In comparison, relatively small spills (less than 50 barrels) into moderate and large rivers would not pose a major toxicological threat. In small to moderate sized streams and rivers, some toxicity might occur in localized areas, such as backwaters where concentrations would likely be higher than in the mainstream of the river.

The likelihood of a release into any single waterbody is low, with an occurrence interval of no more than once every 22,000 to 830,000 years (**Tables 4-7** through **4-10**). If any release did occur, it is likely that the total release volume of a spill likely would be 3 barrels or less based on historical spill volumes.

While a release of crude oil into any given waterbody might cause immediate localized toxicity to aquatic biota, particularly in smaller streams and rivers, the frequency of such an event would be very low. Nevertheless, streams and rivers with aquatic biota represent the sensitive environmental resources that could be temporarily impacted by a crude oil release.

Wetlands/ Reservoirs/ Lakes

Although planning and routing efforts have reduced the overall number of wetlands and static waterbody environments crossed by the Project, wetlands and waterbodies with persistently saturated soils are present along and adjacent to the Project route. The effects of crude oil released into a wetland environment will depend not only upon the quantity of oil released, but also on the physical conditions of the wetland at the time of the release. Wetlands include a wide range of environmental conditions. Wetlands can consist of many acres of standing water dissected with ponds and channels, or they may simply be areas of saturated soil with no open water. A single wetland can even vary between these two extremes as seasonal precipitation varies. Wetland surfaces are generally low gradient with very slow unidirectional flow or no discernable flow. The presence of vegetation or narrow spits of dry land protruding into wetlands also may isolate parts of the wetland. Given these conditions, spilled materials may remain in restricted areas for longer periods than in river environments.

**Table 4-7 Comparison of Estimated Benzene Concentrations Following a Diluted Bitumen Spill to the Acute Toxicity Thresholds for Aquatic Life (7.4 ppm) for Streams Crossed by the Project**

| Throughput 435,000 bpd | Stream Flow Rate (cfs) | Acute Toxicity Threshold (ppm) | Product Released | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Very Small Spill: 3 barrels | | Small Spill: 50 barrels | | Moderate Spill: 1,000 barrels | | Large Spill: 10,000 barrels | |
| | | | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) |
| Low Flow Stream | 10 | 7.4 | 0.7 | 74,681 | 10.9 | 124,469 | 217.5 | 248,938 | 2,175 | 829,792 |
| Lower Moderate Flow Stream | 100 | 7.4 | 0.07 | 52,277 | 1.1 | 87,128 | 21.7 | 174,256 | 218 | 580,854 |
| Upper Moderate Flow Stream | 1,000 | 7.4 | 0.007 | 39,208 | 0.1 | 65,346 | 2.2 | 130,692 | 21.8 | 435,641 |
| High Flow Stream | 10,000 | 7.4 | 0.0007 | 22,404 | 0.01 | 37,341 | 0.2 | 74,681 | 2.2 | 248,938 |

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes (**Appendix A**), which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.15 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of material released divided by 1 hour of stream flow volume. The model assumes uniform mixing conditions.
- Benzene concentrations are compared against the acute toxicity threshold for benzene.
- Shading indicates concentrations that could potentially cause acute toxicity to aquatic species. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of acute toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of 0.000135 incident/mile*year (**Appendix A**), projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

**Table 4-8 Comparison of Estimated Benzene Concentrations Following a Synthetic Crude Spill to the Acute Toxicity Thresholds for Aquatic Life (7.4 ppm) for Streams Crossed by the Project**

| Throughput 435,000 bpd | Stream Flow Rate (cfs) | Acute Toxicity Threshold (ppm) | Product Released: Very Small Spill: 3 barrels | | Small Spill: 50 barrels | | Moderate Spill: 1,000 barrels | | Large Spill: 10,000 barrels | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) |
| Low Flow Stream | 10 | 7.4 | 0.2 | 74,681 | 3.6 | 124,469 | 72 | 248,938 | 725 | 829,792 |
| Lower Moderate Flow Stream | 100 | 7.4 | 0.02 | 52,277 | 0.4 | 87,128 | 7.2 | 174,256 | 72.5 | 580,854 |
| Upper Moderate Flow Stream | 1,000 | 7.4 | 0.002 | 39,208 | 0.04 | 65,346 | 0.7 | 130,692 | 7.2 | 435,641 |
| High Flow Stream | 10,000 | 7.4 | 0.0002 | 22,404 | 0.004 | 37,341 | 0.07 | 74,681 | 0.7 | 248,938 |

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes (**Appendix A**), which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.05 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.05 percent of the total amount of material released divided by 1 hour of stream flow volume. The model assumes uniform mixing conditions.
- Benzene concentrations are compared against the acute toxicity threshold for benzene.
- Shading indicates concentrations that could potentially cause acute toxicity to aquatic species. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of acute toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of 0.000135 incident/mile*year (**Appendix A**), projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

**Table 4-9 Comparison of Estimated Diluted Bitumen Concentrations Following a Spill to the Chronic Toxicity Thresholds for Aquatic Life for Streams Crossed by the Project**

| Throughput 435,000 bpd | Stream Flow Rate (cfs) | Chronic Toxicity Threshold (ppm) | Product Released | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Very Small Spill: 3 barrels | | Small Spill: 50 barrels | | Moderate Spill: 1,000 barrels | | Large Spill: 10,000 barrels | |
| | | | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) |
| Low Flow Stream | 10 | 1.4 | 0.004 | 74,681 | 0.06 | 124,469 | 1.3 | 248,938 | 12.9 | 829,792 |
| Lower Moderate Flow Stream | 100 | 1.4 | 0.0004 | 52,277 | 0.006 | 87,128 | 0.13 | 174,256 | 1.3 | 580,854 |
| Upper Moderate Flow Stream | 1,000 | 1.4 | 0.00004 | 39,208 | 0.0006 | 65,346 | 0.013 | 130,692 | 0.13 | 435,641 |
| High Flow Stream | 10,000 | 1.4 | 0.000004 | 22,404 | 0.00006 | 37,341 | 0.0013 | 74,681 | 0.013 | 248,938 |

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes (**Appendix A**), which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.15 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of material released divided by 7 days of stream flow volume. The model assumes uniform mixing conditions.
- The chronic toxicity value for benzene is based on a 7-day toxicity value of 1.4 ppm for trout.
- Exposure concentrations were estimated over a 7-day period since the chronic toxicity value was based on a 7-day exposure.
- Shading indicates concentrations that could potentially cause chronic toxicity to aquatic species. The darkest shading represents high probability of chronic toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of chronic toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of chronic toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of 0.000135 incident/mile*year (**Appendix A**), projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

**Table 4-10 Comparison of Estimated Synthetic Crude Oil Concentrations Following a Spill to the Chronic Toxicity Thresholds for Aquatic Life for Streams Crossed by the Project**

| Throughput 435,000 bpd | Stream Flow Rate (cfs) | Chronic Toxicity Threshold (ppm) | Product Released | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Very Small Spill: 3 barrels | | Small Spill: 50 barrels | | Moderate Spill: 1,000 barrels | | Large Spill: 10,000 barrels | |
| | | | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) | Benzene Conc. (ppm) | Occurrence Interval (years) |
| Low Flow Stream | 10 | 1.4 | 0.001 | 74,681 | 0.02 | 124,469 | 0.4 | 248,938 | 4.3 | 829,792 |
| Lower Moderate Flow Stream | 100 | 1.4 | 0.0001 | 52,277 | 0.002 | 87,128 | 0.04 | 174,256 | 0.4 | 580,854 |
| Upper Moderate Flow Stream | 1,000 | 1.4 | 0.00001 | 39,208 | 0.0002 | 65,346 | 0.004 | 130,692 | 0.04 | 435,641 |
| High Flow Stream | 10,000 | 1.4 | 0.000001 | 22,404 | 0.00002 | 37,341 | 0.0004 | 74,681 | 0.004 | 248,938 |

Notes:

- Historical data indicate that the most probable spill volume would be 3 barrels or less. However, this entire analysis is based on conservative incident frequencies and volumes calculated from worst-case spill volumes (**Appendix A**), which overestimates the proportion of larger spills. Consequently, the assessment is conservative in its evaluation on the magnitude of environmental consequences.
- Estimated proportion of benzene in the transported material is 0.05 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.05 percent of the total amount of material released divided by 7 days of stream flow volume. The model assumes uniform mixing conditions.
- The chronic toxicity value for benzene is based on a 7-day toxicity value of 1.4 ppm for trout.
- Exposure concentrations were estimated over a 7-day period since the chronic toxicity value was based on a 7-day exposure.
- Shading indicates concentrations that could potentially cause chronic toxicity to aquatic species. The darkest shading represents high probability of chronic toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of chronic toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of chronic toxicity (<toxicity threshold).
- Occurrence intervals are based on an overall predicted incident frequency of 0.000135 incident/mile*year (**Appendix A**), projected frequencies of each spill volume, and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Crude oil released from a subsurface pipe within a wetland could reach the soil surface. If the water table reaches the surface, the release would manifest as floating crude oil. The general lack of surface flow within a wetland would restrict crude oil movement. Where surface water is present within a wetland, the spill would spread laterally across the water's surface and be readily visible during routine ROW surveillance. The depth of soil impacts likely would be minimal, due to shallow (or emergent) groundwater conditions. Conversely, groundwater impacts within the wetland are likely to be confined to the near-surface, enhancing the potential for biodegradation. If humans or other important resource exposures were to occur in proximity to the wetland, then regulatory drivers would mandate the scope of remedial actions, timeframe for remediation activities, and cleanup levels. However, response and remediation efforts in a wetland have the potential for appreciable adverse effects from construction/cleanup equipment. If no active remediation activities were undertaken, natural biodegradation and attenuation would ultimately allow a return to preexisting conditions in both soil and groundwater. This would likely require a timeframe on the order of tens of years. In the unlikely event of a spill, Keystone will utilize the most appropriate cleanup procedures as determined in coordination with the applicable federal and state agencies.

The chance of a spill occurring at any specific wetland along the pipeline is very low. Based on survey data and aerial interpretation, wetlands comprise 46.0 miles of the entire Project (Table 3.5-7 of the Project Environmental Report November 2008). Of the estimated maximum of 2.2 spills postulated to occur during a 10-year period within the entire pipeline system, about 0.06 spill would be expected to occur within wetland areas (equivalent to no more than one spill every 161 years). If any release did occur, it is likely that the total release volume of a spill likely would be 3 barrels or less based on historical spill volumes (**Appendix A**).

The predicted effects of a spill reaching standing water (e.g., reservoirs, lakes) would depend largely upon the volume of crude oil entering the waterbody and the volume of water within the waterbody.

**Table 4-11** summarizes the amount of water necessary to dilute spill volumes below aquatic toxicity and drinking water thresholds. While this preliminary approach does not account for fate and transport mechanisms, mixing zones, environmental factors, and emergency response capabilities, it does provide an initial screening benchmark for identifying areas of potential concern.

**Table 4-11 Amount of Water Required to Dilute Crude Oil Spills Below Benchmark Values**

| Barrels of Crude Oil | Volume of Water Required to Dilute Crude Oil Below Benchmark (acre-feet)[1] | | |
|---|---|---|---|
| | Acute Toxicity Threshold (7.4 milligrams per liter [mg/L]) | Chronic Toxicity Threshold (1.4 mg/L) | Drinking Water MCL (0.005 mg/L) |
| **Diluted Bitumen** | | | |
| 3 | 0.3 | 1.5 | 413 |
| 50 | 4.6 | 24.3 | 6,890 |
| 1,000 | 92.0 | 486 | 136,136 |
| 10,000 | 920 | 4,862 | 1,361,358 |
| **Synthetic Crude** | | | |
| 3 | 0.09 | 0.5 | 138 |
| 50 | 1.6 | 8.2 | 2,297 |
| 1,000 | 31 | 164 | 45,930 |
| 10,000 | 310 | 1,640 | 459,301 |

[1] Benchmarks based on aquatic toxicity and drinking water thresholds established for benzene. The estimated benzene content of the diluted bitumen is 0.15 percent by weight. The synthetic crude oil is estimated to have a benzene content of 0.05 percent by weight.

Based on a review of publicly available toxicity literature for wetland plant groups (i.e., algae, annual macrophytes, and perennial macrophytes), crude oil is toxic to aquatic plants but at higher concentrations than observed for fish and invertebrates. Therefore, spill concentrations that are less than toxic effect levels for fish and invertebrates (see Aquatic Organisms, above) also would not affect wetland plant species.

In summary, while a release of crude oil into wetland and static waterbodies has the potential to cause temporary environmental impacts, the frequency of such an event would be very low.

## 4.3 Risk to Populated and High Consequence Areas

Consequences of inadvertent releases from pipelines can vary greatly, depending on where the release occurs. Pipeline safety regulations use the concept of HCAs to identify specific locales and areas where a release could have the most significant adverse consequences. HCAs include populated areas, designated zones around public drinking water intakes, and unusually sensitive ecologically resource areas (USAs) that could be damaged by a hazardous liquid pipeline release. **Table 4-12** identifies the types and lengths of HCAs crossed by the Project. These HCA data are compiled from a variety of data sources, including federal and state agencies (e.g., state drinking water agencies, the USEPA). PHMSA acknowledges that spills within a sensitive area might not actually impact the sensitive resource and encourages operators to conduct detailed analysis, as needed. Keystone has conducted a preliminary evaluation of HCAs crossed or located downstream of the pipeline (**Appendix B**). Portions of the pipeline that could potentially affect HCAs will be subject to higher levels of inspection, as per 49 CFR Part 195. Furthermore, Keystone has subsequently evaluated the location of valves as a measure to reduce potential risk to HCAs. As a result of the preliminary HCA evaluation, some proposed valve locations were moved and additional valves were added to protect HCAs (**Appendix B**).

**Table 4-12 Mileage Summary of PHMSA-Defined HCAs Identified Along the Project Route**

| | **Miles of Pipeline** | | | | **Projected Number of Spills in 10 years (occurrence interval)** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Populated Areas** | **Drinking Water** | **Ecologically Sensitive Area** | **Total in HCAs[1]** | **Populated Areas** | **Drinking Water** | **Ecologically Sensitive Area** | **Total HCAs[1]** |
| Montana | 0.0 | 0.0 | 0.4 | 0.4 | NA | NA | 0.0005 (18,600 years) | 0.0005 |
| South Dakota | 0.0 | 0.0 | 14.9 | 14.9 | NA | NA | 0.02 (500 years) | 0.02 |
| Nebraska | 0.0 | 0.0 | 3.9 | 3.9 | NA | NA | 0.005 (1,900 years) | 0.005 |
| ***Steele City subtotal*** | **0.0** | 0.0 | **19.1** | **19.1** | NA | NA | **0.03 (390 years)** | **0.03** |
| Nebraska | 0.0 | 0.0 | 0.0 | 0.0 | NA | NA | NA | NA |
| Kansas | 1.7 | 29.7 | 36.1 | 52.9 | 0.002 (4,400 years) | 0.04 (250 years) | 0.05 (210 years) | 0.07 |

**Table 4-12 Mileage Summary of PHMSA-Defined HCAs Identified Along the Project Route**

| | Miles of Pipeline | | | | Projected Number of Spills in 10 years (occurrence interval) | | | |
|---|---|---|---|---|---|---|---|---|
| | **Populated Areas** | **Drinking Water** | **Ecologically Sensitive Area** | **Total in HCAs[1]** | **Populated Areas** | **Drinking Water** | **Ecologically Sensitive Area** | **Total HCAs[1]** |
| Oklahoma | 0.0 | 10.0 | 3.1 | 11.9 | NA | 0.01 (740 years) | 0.004 (2,400 years) | 0.02 |
| ***Cushing Extension subtotal*** | ***1.7*** | ***39.7*** | ***39.2*** | ***64.8*** | ***0.002 (4,400 years)*** | ***0.05 (190 years)*** | ***0.05 (190 years)*** | ***0.09*** |
| Oklahoma | 3.2 | 10.5 | 3.9 | 12.3 | 0.004 (2,300 years) | 0.01 (700 years) | 0.005 (1,900 years) | 0.02 |
| Texas | 8.9 | 16.4 | 1.6 | 25.6 | 0.01 (830 years) | 0.02 (450 years) | 0.002 (4,600 years) | 0.03 |
| ***Gulf Coast Subtotal*** | ***12.1*** | ***26.9*** | ***5.6*** | ***37.9*** | ***0.02 (600 years)*** | ***0.04 (280 years)*** | ***0.008 (1,300 years)*** | ***0.05*** |
| Texas – Houston Lateral | 3.4 | 17.6 | 0.0 | 19.3 | 0.005 (2,200 years) | 0.02 (420 years) | NA | 0.03 |
| **Project Total** | **17.2** | **84.3** | **63.9** | **141.2** | **0.02 (430 years)** | **0.1 (90 years)** | **0.09 (120 years)** | **0.2 (53 years)** |

[1] Numbers are not additive because some miles overlap in the different types of HCAs.

Note: NA indicates no PHMSA-defined populated area within the segment.

Projected number of spills in 10 years and occurrence interval were conservatively estimated based on the conservative probability of spills (0.000135 incidents/mile*year). This conservative analysis intentionally overestimates the potential risk, and assumes risk is evenly distributed along the entire Project and includes the Keystone Cushing Extension.

Assuming that 2.2 spills occurred along the Project in a 10-year period, it is estimated that approximately 0.2 of these spills would occur in HCAs. Although the number of predicted spills in HCAs is relatively small, the potential impacts of these individual spills are expected to be greater than in other areas due to the environmental sensitivity within these areas. **Table 4-13** also shows the number of spills and their predicted sizes.

**Table 4-13 Release and Spill Volume Occurrence Interval Associated with the Project**

| | Miles of Pipe[1] | Total Number of Predicted Spills | <3 barrels | 3 to 50 barrels | 50 to 1,000 barrels | 1,000 to 10,000 barrels |
|---|---|---|---|---|---|---|
| **Steele City** | | | | | | |
| Populated Areas | 0.0 | NA | NA | NA | NA | NA |
| Drinking Water Areas | 0.0 | NA | NA | NA | NA | NA |
| Ecologically Sensitive Areas | 19.1 | 0.003 (390 years) | 0.001 (780 years) | 0.0008 (1,300 years) | 0.0004 (2,600 years) | 0.0001 (8,600 years) |
| **Cushing Extension** | | | | | | |
| Populated Areas[2] | 1.7 | 0.0002 (4,400 years) | 0.0001 (8,700 years) | 0.00007 (15,600 years) | 0.00003 (29,000 years) | 0.00001 (97,000 years) |
| Drinking Water Areas | 39.7 | 0.005 (190 years) | 0.003 (370 years) | 0.002 (600 years) | 0.0008 (1,200 years) | 0.0002 (4,200 years) |
| Ecologically Sensitive Areas | 39.2 | 0.005 (190 years) | 0.003 (380 years) | 0.002 (630 years) | 0.0008 (1,300 years) | 0.0002 (4,200 years) |
| **Gulf Coast** | | | | | | |
| Populated Areas | 12.1 | 0.002 (610 years) | 0.0008 (1,200 years) | 0.0005 (2,000 years) | 0.0002 (4,100 years) | 0.00007 (13,600 years) |
| Drinking Water Areas | 26.9 | 0.004 (280 years) | 0.002 (550 years) | 0.001 (920 years) | 0.0005 (1,800 years) | 0.0002 (6,100 years) |
| Ecologically Sensitive Areas | 5.6 | 0.0007 (1,300 years) | 0.0003 (2,700 years) | 0.0002 (4,400 years) | 0.0001 (8,800 years) | 0.00003 (29,000 years) |
| **Houston Lateral** | | | | | | |
| Populated Areas | 3.4 | 0.0005 (2,200 years) | 0.0002 (4,400 years) | 0.0001 (7,300 years) | 0.00007 (15,000 years) | 0.00002 (49,000 years) |
| Drinking Water Areas | 17.6 | 0.002 (420 years) | 0.001 (840 years) | 0.0007 (1,400 years) | 0.0004 (2,800 years) | 0.0001 (9,400 years) |
| Ecologically Sensitive Areas | 0.0 | NA | NA | NA | NA | NA |

**Table 4-13 Release and Spill Volume Occurrence Interval Associated with the Project**

| | Miles of Pipe[1] | Total Number of Predicted Spills | <3 barrels | 3 to 50 barrels | 50 to 1,000 barrels | 1,000 to 10,000 barrels |
|---|---|---|---|---|---|---|
| **Entire Project** | | | | | | |
| Populated Areas | 17.2 | 0.002 (430 years) | 0.001 (860 years) | 0.0007 (1,400 years) | 0.0003 (2,900 years) | 0.0001 (9,600 years) |
| Drinking Water Areas | 84.3 | 0.01 (90 years) | 0.006 (180 years) | 0.003 (300 years) | 0.002 (590 years) | 0.0005 (2,000 years) |
| Ecologically Sensitive Areas | 63.9 | 0.009 (120 years) | 0.004 (230 years) | 0.003 (390 years) | 0.001 (780 years) | 0.0004 (2,600 years) |

[1] The amount of pipe located within HCAs was quantified by the Project's geographical information system and was based on the intersection of the pipeline's centerline and PHMSA-defined HCAs. Probability of a spill was based on the conservative incident frequency of 0.000135 incident per mile per year (**Appendix A**).

### 4.3.1 Populated Areas

PHMSA-defined populated areas occur along 17.2 miles of the Project. These populated areas have been classified as HCAs based on US Census data (**Table 4-12**). Approximately 90 percent (15.5 miles) of these miles are located within the Gulf Coast Segment. Keystone has conducted a more thorough evaluation to identify HCAs associated with populated areas (**Appendix B**).

### 4.3.2 Drinking Water

PHMSA identifies certain surface water and groundwater resources as drinking water USAs (49 CFR Sections 195.6 and 195.450). Surface water USAs include intakes for community water systems and non-transient non-community water systems that do not have an adequate alternative drinking water source. Groundwater USAs include the source water protection area for community water systems and non-transient non-community water systems that obtain their water supply from a Class I or Class IIA aquifer and do not have an adequate alternative drinking water source. If the source water protection area has not been established by the state, the wellhead protection area becomes the USA.

Surface water USAs identified for their potential as a drinking water resource have a 5-mile buffer placed around their intake location. The groundwater USAs have buffers that vary in size. These buffers are designated by the state's source water protection program or their wellhead protection program and the buffer sizes vary from state to state.

Isolated segments of the Project cross areas that are considered HCAs by the PHMSA due to potential risks to sensitive drinking water resources (**Table 4-12**). These areas occur along the Keystone Cushing Extension and Gulf Coast Segment of the Project; there are no drinking water HCAs crossed by the route within the Steele City Segment. Keystone has conducted a more thorough evaluation to identify HCAs associated with sensitive drinking water resources (**Appendix B**). Segments of the pipeline that could potentially affect HCAs will be subject to higher levels of inspection, as per 49 CFR Part 195. Based on Keystone's assessment, some valve locations have been moved and additional valves have been added to protect drinking water USAs.

### 4.3.3 Ecologically Sensitive Ares

Certain ecologically sensitive areas are classified as HCAs by PHMSA due to potential risks to unusually sensitive ecological resources. These areas focus on the characteristics of rarity, imperilment, or the potential for loss of large segments of an abundant population during periods of migratory concentration. These include:

- Critically imperiled and imperiled species and/or ecological communities;
- Threatened and endangered species (or multi-species assemblages where three or more different candidate resources co-occur);
- Migratory waterbird concentrations;
- Areas containing candidate species or ecological communities identified as excellent or good quality; and
- Areas containing aquatic or terrestrial candidate species and ecological communities that are limited in range.

Portions of the Project cross ecologically sensitive HCAs (**Table 4-12**). These ecologically sensitive HCAs are frequently associated with major river systems (e.g., Missouri, Platte, and Canadian rivers). As with other HCAs, these locations will be subject to higher levels of inspection, as per 49 CFR Part 195, in order to reduce the chance of pipeline incident.

### 4.3.4 Management of Risk Within HCAs

To protect particularly sensitive resources, HCAs would be subject to a higher level of inspection per USDOT regulations. Federal regulations require periodic assessment of the pipe condition and timely correction of identified anomalies within HCAs. Keystone will develop management and analysis processes that integrate available integrity-related data and information and assess the risks associated with segments that can affect HCAs.

Keystone will conduct a yearly survey to locate HCA changes along the pipeline system. If portions of he pipeline become population HCAs during the operational pipeline life, Keystone will notify the appropriate representatives at PHMSA.

Due to Homeland Security reasons, the precise risk for specific locations of HCAs is highly confidential. Keystone is therefore providing a confidential preliminary evaluation of risk to HCAs for federal agencies (**Appendix B**). Per federal regulations (Integrity Management Rule, 49 CFR Part 195), the site-specific evaluation of risk is an ongoing process and is regulated by the PHMSA.

Based on Keystone's preliminary assessment of HCAs (**Appendix B**), some valve locations were moved from their initial locations and additional valves have been added to provide supplemental protection of HCAs, where warranted. In addition, Keystone will develop and implement a risk-based integrity management program (IMP). The IMP will use state-of-practice technologies applied within a comprehensive risk-based methodology to assess and mitigate risk associated with all pipeline segments including HCAs.

# 5.0 Keystone’s Pipeline Safety Program

Pipelines are one of the safest forms of crude oil transportation and provide a cost-effective and safe mode of transportation for oil on land. Overland transportation of oil by truck or rail produces higher risk of injury to the general public than the proposed pipeline (USDOT 2002). The Project will be designed, constructed, and maintained in a manner that meets or exceeds industry standards.

Safeguards have been implemented during design, and will be implemented during construction and operations of the pipeline. Steel suppliers, mills and coating plants are pre-qualified using a formal qualification process consistent with ISO standards. The pipe is engineered with stringent chemistry for such compounds as carbon to ensure weldability during construction. Each batch of pipe is mechanically tested to prove strength, fracture control and fracture propagation properties. The pipe is hydrostatically tested. The pipe seams are visually and manually inspected and also inspected using ultrasonic instruments. Each pipe joint is traceable to the steel supplier and pipe mill shift during production. The coating is inspected in the plant with stringent tolerances on roundness, nominal wall thickness. A formal quality surveillance program is in place at the steel mill and coating plant. During construction, inspection will be performed on various aspects on the pipeline activities. The pipeline field welds will be non-destructively tested and the pipeline will be hydrostatically tested.

Historically, one of the most significant risk associated with operating a crude oil pipeline is the potential for third-party excavation damage. To minimize the risk of third party damage, the pipeline will be built within an approved ROW and markers will be installed at all road, railway, and water crossings. The depth of cover required by federal regulations is 30 inches in most locations. In an effort to reduce excavation damage, Keystone has taken the proactive measure to increase the typical depth of cover to 4 feet (18 inches more cover than federal requirements).

Keystone will have a maintenance, inspection, and repair program that ensures the integrity of the pipeline during operations. Keystone's annual Pipeline Maintenance Program (PMP) will be designed to maintain the safe and reliable operation of the pipeline. The PMP is underpinned by a company-wide goal to ensure facilities are reliable and in service. Data collected in each year of the program will be fed back into the decision-making process for the development of the following year's program.

Keystone will mitigate third-party excavation risk by implementing comprehensive Public Awareness and Damage Prevention programs focused on education and awareness in accordance with 49 CFR Section 195.440 and API RP1162. Further, Keystone’s operating staff will complete regular visual inspections (ground or aerial) of the ROW as per 49 CFR Section 195.412 and monitor activity in the area to prevent unauthorized trespass or access.

To mitigate the effects of corrosion on the pipeline, Keystone will use fusion bonded epoxy (FBE), a protective coating that is applied to the external surface of the pipe to prevent corrosion. A cathodic protection system is installed, comprised of engineered metal alloys or anodes, which are connected to the pipeline. A low voltage direct current is applied to the pipeline; the process corrodes the anodes rather than the pipeline. A tariff specification of 0.5 percent sediment and water by volume is contained in Keystone’s transportation agreement with its shippers. This specification is lower than the industry standard of 1 percent to minimize the potential for internal corrosion. The pipeline is designed to operate in turbulent flow to minimize water drop out, which is also a potential cause of internal corrosion. During operations, the pipeline is cleaned using in-line inspection tools. The pipeline is inspected with a smart in-line inspection tool, which measures and records internal and external metal loss, thereby allowing Keystone the ability to proactively detect corrosion.

In addition, the pipeline will be monitored 24 hours a day, 365 days a year from the Operations Control Center (OCC) using a sophisticated SCADA system. In an event of a leak or rupture, Keystone would implement multiple leak detection methods and systems that are overlapping in nature and progress through a series of leak detection thresholds. The leak detection methods are as follows:

- Remote monitoring performed by the OCC Operator, which consists of monitoring pressure and flow data received from pump stations and valve sites fed back to the OCC by the Keystone SCADA system. Remote monitoring is typically able to detect leaks down to approximately 25 to 30 percent of the pipeline flow rate.
- Software-based volume balance systems that monitor receipt and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of the pipeline flow rate.
- Computational Pipeline Monitoring or model-based leak detection systems that break the pipeline into smaller segments and monitor each of these segments on a mass balance basis. These systems are typically capable of detecting leaks down to a level of approximately 1.5 to 2 percent of pipeline flow rate.
- Computer-based, non-real time accumulated gain/(loss) volume trending to assist in identifying low rate or seepage releases below the 1.5 to 2 percent by volume detection thresholds.
- Direct observation methods, which include aerial patrols, ground patrols, and public and landowner awareness programs that are designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline.

The leak detection system will be configured in a manner capable of alarming the OCC operators through the SCADA system and also will provide the OCC operators with a comprehensive assortment of display screens for incident analysis and investigation. In addition, there will be a redundant, stand-by OCC to be used in case of emergency.

Lastly, Keystone will have an Emergency Response Program (ERP) in place to respond to incidents. The ERP contains comprehensive manuals, detailed training plans, equipment requirements, resources plans, auditing, change management and continuous improvement processes. The Integrity Management Program (IMP) (49 CFR Part 195) and ERP will ensure Keystone will operate the pipeline in an environmentally responsible manner.

# 6.0 Conclusion

In summary, this conservative analysis of the proposed Project shows that the predicted frequency of incidents is very low, the probability of a large spill occurring is very low, and, consequently, risk of environmental impacts is minimal. Compliance with regulations, application of Keystone's IMPs and Emergency Response Plan, as well as adherence to safety procedures will help to ensure long-term environmentally responsible and safe operation of the pipeline.

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# 8.0 Glossary

**Accidental Release**

An accidental release is an unplanned occurrence that results in a release of oil from a pipeline.

**Acute exposure**

Exposure to a chemical or situation for a short period of time.

**Acute toxicity**

The ability of a substance to cause severe biological harm or death soon after a single exposure or dose.

**Adverse effect**

Any effect that causes harm to the normal functioning of plants or animals due to exposure to a substance (i.e., a chemical contaminant).

**Algae**

Chiefly aquatic, eukaryotic one-celled or multicellular plants without true stems, roots and leaves that are typically autotrophic, photosynthetic, and contain chlorophyll. They are food for fish and small aquatic animals.

**Aquifer**

An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted using a water well.

**Barrel**

A barrel is a standard measure of a volume of oil and is equal to 42 gallons.

**Benthic invertebrates**

Those animals without backbones that live on or in the sediments of a lake, pond, river, etc.

**Bioavailability**

How easily a plant or animal can absorb a particular contaminant from the environment.

**Biodegradation**

Biodegradation is the breakdown of organic contaminants by microbial organisms into smaller compounds. The microbial organisms transform the contaminants through metabolic or enzymatic processes. Biodegradation processes vary greatly, but frequently the final product of the degradation is carbon dioxide or methane.

**BPD**

Abbreviation for barrels per day.

**Cathodic Protection System**

A technique to provide corrosion protection to a metal surface by making the surface of the metal object the cathode of an electrochemical cell. In the pipeline industry that is done using impressed current. Impressed current cathodic protection systems use an anode connected to a DC power source (a cathodic protection rectifier).

**Chronic toxicity**

The capacity of a substance to cause long-term poisonous health effects in humans, animals, fish, or other organisms. Biological tests use sublethal effects, such as abnormal development, growth, and reproduction, rather than mortality, as endpoints.

**Contaminant**

Any physical, chemical, biological, or radiological substance found in air, water, soil or biological matter that has a harmful effect on plants or animals; harmful or hazardous matter introduced into the environment.

**Ecosystem**

The sum of all the living plants and animals, their interactions, and the physical components in a particular area.

**Emergency Flow Restricting Device**

An emergency flow-restricting device is a device used to restrict or limit the amount of oil that can release out of a leak or break in a pipeline. Check valves and remote control valves are types of emergency flow restricting devices.

**Exposure**

How a biological system (i.e., ecosystem), plant, or animal comes in contact with a chemical.

**Event**

An event is a significant occurrence or happening. As applicable to pipeline safety, an event could be an accident, abnormal condition, incident, equipment failure, human failure, or release.

**Facility**

Any structure, underground or above, used to transmit a product.

**Geographical Information System**

A computer data system for creating and managing spatial data and associated attributes.

**Habitat**

The place where a population of plants or animals and its surroundings are located, including both living and non-living components.

**High Consequence Area (HCA)**

A high consequence area is a location that is specially defined in PHMSA pipeline safety regulations as an area where pipeline releases could have greater consequences to health and safety or the environment. For oil pipelines, HCAs include high population areas, other population areas, commercially navigable waterways, and areas unusually sensitive to environmental damage, including certain ecologically sensitive areas and drinking water resources. Regulations require a pipeline operator to take specific steps to ensure the integrity of a pipeline for which a release could affect an HCA and, thereby, provide protection of the HCA.

**High Population Area**

A high population area is an urbanized area, as defined and delineated by the US Census Bureau, which contains 50,000 or more people and has a population density of at least 1,000 people per square mile. High population areas are considered HCAs.

**Incident**

As used in pipeline safety regulations, an incident is an event occurring on a pipeline for which the operator must make a report to the Office of Pipeline Safety. There are specific reporting criteria that define an incident that include the volume of the material released, monetary property damage, injuries, and fatalities (Reference 49 CFR Section 191.3, 49 CFR Section 195.50).

**Incident Frequency**

Incident frequency is the rate at which failures are observed or are predicted to occur, expressed as events per given timeframe.

**Incident Probability**

Incident probability is the probability that a structure, device, equipment, system, etc. will fail on demand or will fail in a given time interval, expressed as a value from 0 to 1.

**Incident Rate**

Incident rate is the rate at which failures occur. It is the number of failure events that occur divided by the total elapsed operating time during which those events occur or by the total number of demands, as applicable.

**Integrity Management Program (IMP)**

An IMP is a documented set of policies, processes, and procedures that are implemented to ensure the integrity of a pipeline. An oil pipeline operator's IMP must comply with the federal regulations (i.e., the Integrity Management Rule, 49 CFR Part 195).

**Integrity Management Rule**

The Integrity Management Rule specifies regulations to assess, evaluate, repair, and validate the integrity of hazardous liquid pipelines that, in the event of a leak or failure, could affect HCAs.

**Invertebrates**

Animals without backbones: e.g., insects, spiders, crayfish, worms, snails, mussels, clams, etc.

**$LC_{50}$**

A concentration expected to be lethal to 50 percent of a group of test organisms.

**Leak**

A leak is a small opening, crack, or hole in a pipeline allowing a release of oil.

**Likelihood**

Likelihood refers to the probability that something possible may occur. The likelihood may be expressed as a frequency (e.g., events per year), a probability of occurrence during a time interval (e.g., annual probability), or a conditional probability (e.g., probability of occurrence, given that a precursor event has occurred).

**Maximum Contaminant Level (MCL)**

The maximum level of a contaminant allowed in drinking water by federal or state law and is based on the avoidance of health effects and currently available water treatment methods.

**National Pipeline Mapping System (NPMS)**

The National Pipeline Mapping System is a geographical information system database that contains the locations and selected attributes of natural gas transmission lines, hazardous liquid trunklines, and liquefied natural gas facilities operating in onshore and offshore territories of the US.

**One-Call System**

A one-call system is a system that allows excavators (individuals, professional contractors, and governmental organizations) to make one telephone call to underground facility operators to provide notification of their intent to dig. The facility operators or, in some cases, the one-call center can then locate the facilities before the excavation begins so that extra care can be taken to avoid damaging the facilities. All 50 states within the US are covered by one-call systems. Most states have laws requiring the use of the one-call system at least 48 hours before beginning an excavation.

**Other Populated Areas**

An ‘other populated area’ is a census designated place, defined and delineated by the US Census Bureau as settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located. Other populated areas are considered HCAs by PHMSA.

**Operator**

An operator is a person who owns or operates pipeline facilities (Reference 49 CFR Section 195.2).

**Polycyclic Aromatic Hydrocarbons (PAHs)**

Group of organic chemicals.

**Pipeline**

Used broadly, pipeline includes all parts of those physical facilities through which gas, hazardous liquid, or carbon dioxide moves in transportation. Pipeline includes but is not limited to: line pipe, valves and other appurtenances attached to the pipe, pumping/compressor units and associated fabricated units, metering, regulating, and delivery stations, and holders and fabricated assemblies located therein, and breakout tanks.

**Playa Lake**

A rain-filled small, round depression in the surface of the ground.

**Prairie Pothole**

Water-holding depressions of glacial origin in the prairies of northern US and southern Canada. Water is supplied by rainfall, basin runoff and seepage inflow of groundwater.

**Receptor**

The species, population, community, habitat, etc. that may be exposed to contaminants.

**Risk**

Risk is a measure of both the likelihood that an adverse event could occur and the magnitude of the expected consequences should it occur.

**Sediment**

The material of the bottom of a body of water (i.e., pond, river, stream, etc.).

**Stressor**

Any factor that may harm plants or animals; includes chemical (e.g., metals or organic compounds), physical (e.g., extreme temperatures, fire, storms, flooding, and construction/development) and biological (e.g., disease, parasites, depredation, and competition).

**Supervisory Control and Data Acquisition System**

A supervisory control and data acquisition system is a pipeline control system designed to gather information such as pipeline pressures and flow rates from remote locations and regularly transmit this information to a central control facility where the data can be monitored and analyzed.

**Throughput**

The volume of oil through a pipeline during a specified time (e.g., barrels per day).

**Toxicity Testing**

A type of test that studies the harmful effects of chemicals on particular plants or animals.

**Toxicity Threshold**

Numerical values that represent concentrations of contaminants in abiotic media (sediments, water, soil) or tissues of plants and animals above which those contaminants are expected to cause harm.

**Unusually Sensitive Areas (USAs)**

USAs refers to certain drinking water and ecological resource areas that are unusually sensitive to environmental damage from a hazardous liquid pipeline release, as defined in 49 CFR Section 195.6.

**Zooplankton**

Small, usually microscopic animals (such as protozoans) found in lakes and reservoirs.

# Appendix A

# Analysis of Incident Frequencies and Spill Volumes for Environmental Consequence Estimation for the Keystone XL Project

July 6, 2009

# Analysis of Incident Frequencies and Spill Volumes for Environmental Consequence Estimation for the Keystone XL Project

TransCanada
In business to deliver

**TransCanada Keystone Pipeline, LP**

**July 2009**


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# 1.0 Introduction

TransCanada Keystone Pipeline, LP (Keystone) proposes to construct and operate a new crude oil pipeline and related facilities from Hardisty, Alberta, Canada to the Port Arthur and east Houston areas of Texas in the United States (US). The project, known as the Keystone XL Pipeline Project (Project), will have a nominal capacity to deliver up to 900,000 barrels per day of crude oil from an oil supply hub near Hardisty, Alberta to existing terminals in Nederland near Port Arthur, Texas, and the Moore Junction in Houston, Texas. See the proposed Project route in **Figure A-1**.


**Figure A-1 Overview of the Project**

In total, the Project will consist of approximately 1,707 miles of new, 36-inch-diameter pipeline, consisting of about 327 miles in Canada and 1,375 miles within the US. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension segment of the Keystone Pipeline Project (Keystone Cushing Extension). The Project proposes to transport up to 900,000 barrels of crude oil per day. This proposed volume would be 309,000 barrels greater than the rate of 591,000 barrels per day that was analyzed for the Keystone Cushing Extension in the previous Keystone

Pipeline permitting process, completed in 2008. Spill risk and potential environmental consequences described in this Risk Assessment are based on transportation of 900,000 barrels per day through all Project pipeline segments within the U.S. Because of this increase in throughput volume, the Keystone Cushing Extension is included as part of the overall Keystone XL Project for spill risk analysis purposes. Key design parameters associated with the Project are identified in **Table A-1**.

**Table A-1 Project Design Parameters**

| Parameter | Value |
|---|---|
| Pipe Specifications | 36-inch high-strength steel (X70 or X80). |
| Coating | Fusion bond epoxy (FBE) coating. |
| Maximum Pump Station Discharge Pressure | 1,440 psig. |
| Maximum Operating Pressure | 1,440 psig, 1,600 psig[1] |
| Depth of Cover | Generally 4 feet of cover, exceeding federal requirements. |
| Aboveground versus Belowground Piping | Pipe will be belowground except within pump stations, valve sites, and terminal facilities. |
| Pipe Wall Thickness | Varies due to engineering and regulatory requirement (0.485 inch to 0.748 inch). |
| Intermediate Remotely Operated Mainline Valves (includes Cushing Extension) | 57 remotely operated intermediate mainline valves. |
| Intermediate Mainline Check Valves (includes Cushing Extension) | 32 intermediate mainline check valves and mainline/check valve sets. |
| Pump Stations | 30 pump stations in the US. |
| Leak Prevention Program | Multiple overlapping and redundant systems, including:<br>• Quality Assurance program for pipe manufacture and pipe coating;<br>• FBE coating;<br>• cathodic protection;<br>• non-destructive testing of 100 percent of the girth welds;<br>• hydrostatic testing to 125 percent of the maximum operating pressure (MOP);<br>• periodic internal cleaning and high-resolution in-line inspection;<br>• depth of cover exceeding federal standards;<br>• periodic aerial surveillance in accordance with federal requirements;<br>• public awareness program;<br>• Supervisory Control and Data Acquisition (SCADA) system; and<br>• Operations Control Center (with complete redundant backup) providing monitoring of the pipeline every 5 seconds, 24 hours a day, every day of the year. |

**Table A-1 Project Design Parameters**

| Parameter | Value |
|---|---|
| Leak Detection Systems | • Remote Monitoring with SCADA;<br>• volume balancing systems;<br>• computational pipeline monitoring;<br>• non-real time volume trending analysis; and<br>• direct observation. |
| Direct Observation Surveillance Frequency | • Aerial surveillance: 26 times per year, not to exceed 3 weeks intervals; and<br>• periodic Close Interval Survey (CIS) integrated with in-line-inspection assessments. |

[1] The design of the Project pipeline system is based on a maximum 1,440 pounds per square inch gauge (psig) discharge pressure at each pump station. The result is that the MOP of the pipeline between pump stations is generally 1,440 psig. In liquid pipelines, some sections at lower elevations relative to the pump station discharge may be exposed to slightly higher pressures due to the combined station discharge pressure and hydrostatic head.

This report evaluates the potential incident frequency and worst-case spill volumes for the Project. The results of this analysis will be incorporated into Keystone's initial risk assessment that evaluates spill risk and its potential environmental consequences.

The values within this document overestimate risk associated with the Project to a level much greater than what is actually anticipated to occur. The purpose of overestimating risk is threefold. First, the incident frequency and spill volume estimates provide a highly conservative range of effects anticipated from the operation of the Project, which is appropriate for the purposes of the National Environmental Policy Act. Second, the incident frequency and spill volume analysis provides a preliminary evaluation of risk during the pipeline's design phase, providing early indications of possible valve locations. Third, the preliminary incident frequency and spill volume analysis provides Keystone with an initial basis for the development of emergency response planning and eventual incorporation of the Project into Keystone's Integrity Management Program. Given these objectives, the analysis summarized within this appendix is intentionally conservative (i.e., overestimates risk). Keystone's expectation is that the incident frequencies and spill volumes presented in this analysis are not likely to occur, but are provided as a highly conservative framework to ensure agency decisions are based on knowledge of the potential range of effects, as well as allowing Keystone to identify optimal valve locations and to prepare the worst-case scenarios in its emergency response preparations.

This document discusses the procedures used to estimate incident frequencies and spill volumes for the Project. Chapter 2.0 identifies the primary causes of pipeline incidents.[1] Chapter 3.0 discusses the potential frequency of these primary causes for the Project. Chapter 4.0 combines each of the state-specific incident frequencies into an overall, project-wide incident frequency. Chapter 5.0 discusses maximum spill volumes estimated for the Project and compares these values with historical spill volume data.

[1] The term "incident" can range from a small drip to a complete pipeline rupture. The volume of the most common incident is small, consisting of three barrels or less, as discussed in Chapter 6.0.

# 2.0 Applicable Threats

In order to establish the particular incident threats that would apply to the Project at service initiation, three key points were considered:

- This is a new construction project, developed with the benefit of TransCanada's more than 50 years of pipeline construction and operating experience;
- The Project will be constructed and operated in accordance with comprehensive regulatory guidelines (49 CFR 195) and pipeline design standards (ASME B31.4), and;
- Keystone has applied for a Special Permit from the Pipeline and Hazardous Materials Administration (PHMSA) that would allow Keystone to design, construct, and operate the Project up to 80 percent of the steel pipe's specified minimum yield strength (SMYS) in all but limited areas, rather than 72 percent SMYS as otherwise required by federal regulations. To ensure that the safety of the pipeline in areas subject to the Special Permit is equal to or greater than the safety under the otherwise applicable regulations, the PHMSA Special Permit will include a multitude of supplemental requirements that exceed industry standards and current regulations.

Taking these factors into consideration, the applicable threats can be determined using American Society of Mechanical Engineers (ASME) B31.8S and American Petroleum Institute (API) 1160 as guidance.

## 2.1 Time Dependent Threats

### 2.1.1 Corrosion

#### 2.1.1.1 External Corrosion

External corrosion is a pertinent threat to all steel pipelines. On a newly constructed pipeline, external corrosion is not considered to be a primary integrity threat. Nonetheless, external corrosion must be considered.

#### 2.1.1.2 Internal Corrosion

In a hazardous liquid pipeline, internal corrosion can occur for a number of reasons (product corrosivity, water drop out due to flow conditions, suspended solids). On a new pipeline, internal corrosion is not considered to be a primary threat; however, it must be considered.

### 2.1.2 Stress Corrosion Cracking

Stress corrosion cracking (SCC) refers to localized pipe damage (cracks) caused by the combined influence of a susceptible pipeline coating, conducive environment (e.g., corrosive soils), operational stresses, and to a limited extent, temperature of the pipe. The coating system to be used on the Project is a high performance FBE. This coating system provides excellent protection against SCC due to the performance of the primer and the durability of the applied epoxy coating. According to Canadian Energy Pipeline Association Recommended Practices 2nd Edition Section 5.1.1.1, Coating Type and Coating Condition, "No SCC has been documented in association with FBE, field applied epoxy or epoxy urethanes, or extruded polyethylene" and according to PHMSA[2], "applying special coatings (fusion bonded epoxy) will protect the pipeline from the occurrence of SCC." Additionally, the cathodic protection system will be monitored to prevent cathodic protection

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[2] PHMSA Fact Sheet on Stress Corrosion Cracking 120604 http://primis.phmsa.dot.gov

overcharging, which could promote SCC growth. Consequently, SCC is not considered to be a viable threat for the Project.

## 2.2 Stable Threats

### 2.2.1 Materials and Construction

#### 2.2.1.1 Materials (Manufacturing) Related

In addition to the conditions expected to be contained in the PHMSA Special Permit, Keystone's current internal quality management system (which includes mill inspection and ongoing surveillance, as well as material and chemical testing) will ensure the highest quality steel pipe is used. Manufacturing defects, such as the presence of hard spots or long seam defects are extremely unlikely. While not a primary threat, this analysis retained materials-related incidents as a secondary threat.

#### 2.2.1.2 Construction (Welding and Fabrication) Related

In addition to the conditions expected to be contained in the PHMSA Special Permit, the Project's proprietary construction specifications will require Keystone to follow exacting procedures along with rigorous testing and inspection to ensure the highest quality construction practices are used. While not a primary threat, this analysis retained construction-related incidents as a secondary threat.

### 2.2.2 Equipment

Equipment-related incidents are incidents associated with certain equipment used on pipelines, such as flange gaskets, regulator valves, set point drift on regulators, O-rings, valve seals, and packings. The Project will not have any flanges below grade (only located aboveground within pump stations), as all mainline valves will be manufactured as weld-end valves. As required by 49 Code of Federal Regulations (CFR) Section 195.420, each mainline valve must be inspected twice per year. All sub-assemblies will be hydrostatically tested in the fabrication shop to a minimum of 125 percent of MOP for 4 hours. For such aboveground equipment, a small leak is the typical failure mode if an incident occurs.

Because equipment is so localized and spill volume is minimal, equipment-related incidents are not considered to be a primary or secondary threat for the purposes of this assessment and are not considered further.

## 2.3 Time Independent Threats

### 2.3.1 Excavation (Third-party) Damage

Damage due to third-party excavation/mechanical damage is the most prevalent threat to most buried pipelines. This threat is considered to be a primary threat to the Project and will continuously be assessed both during design and operation phases of the Project.

### 2.3.2 Hydraulic Event (Incorrect Operations)

Incorrect operations or failure to follow standard operating procedures can lead to an overpressure event or hydraulic surge. Although a series of human and mechanical errors would need to occur for a hydraulic event to take place, it is considered a potential secondary threat to the operations of any liquid system and will be addressed in this analysis.

### 2.3.3 Natural Hazards (Ground Movement/Flooding)

Hydrological and geotechnical concerns are very site-specific issues that are considered in the routing and design of the project. The route selection is done to avoid, inasmuch as practical, potentially geologically unstable slopes, meandering streams, saturated soils, and active seismic hazards. Because the threat cannot be completely eliminated, it is considered a secondary threat.

## 2.4 Summary of Threats

The following threats to the Project are considered to be viable for this assessment:

1. Corrosion (External/Internal);
2. Excavation Damage;
3. Materials and Construction (Manufacturing, Welding, and Fabrication);
4. Hydraulic Event (Incorrect Operations); and
5. Ground Movement, Washouts, and Flooding.

# 3.0 PHMSA Baseline Incident Frequencies

Since the Project has not yet been constructed, it does not have an operational history from which to derive incident frequency rates. Consequently, a conservative approach was taken by first determining the baseline incident frequencies from industry data (i.e., PHMSA data) and then utilizing adjustment factors to account for project- and site-specific conditions. These adjustment factors include improved technologies and practices that are used on a newly constructed pipeline and are not currently reflected in the historical PHMSA incident frequencies.

Baseline incident frequencies are derived from historical national pipeline incident data (PHMSA 2008). Since the majority of pipelines in the US were constructed in the “pre-modern” era (i.e., the 1970s or earlier), these baseline frequencies reflect incident rates associated with earlier pipeline design and construction methods that often do not meet the current regulatory requirements or best management practices. Further, these historical data do not account for supplemental protective measures that Keystone will implement, including those expected to be required by the PHMSA Special Permit.

By adjusting baseline incident frequencies to account for improved technologies and practices that will be employed in the pipeline’s design, construction and operations, this analysis provides a more reasonable approximation of incident frequency than unmodified PHMSA baseline frequencies. The adjustment factor for each baseline incident frequency threat ranges from a value of 0.1 -1, where the value 1 would equate the calculated Project frequency to the PHMSA baseline frequency. A fractional adjustment factor less than 1 indicates that the Project incident frequency would be less than that predicted by the PHMSA incident frequency data base. Nevertheless, this analysis selected conservative adjustment factors so that the calculated incident frequencies continue to overestimate risk.

The baseline incident frequencies identified in **Table A-2** were generated from the PHMSA incident database (PHMSA 2008) and are expressed as per mile of pipeline per year (i.e., /mile-year).

**Table A-2 Baseline Incident Frequencies**

| Threat Name | Incident Frequency/mile-yr [1] | Occurrence Interval (years) |
|---|---|---|
| Corrosion | 2.90E-04 | 3,400 |
| Excavation damage | 1.22E-04 | 8,200 |
| Materials and Construction | 3.00E-04 | 3,300 |
| Hydraulic Event | 1.47E-04 | 6,800 |
| Ground movement | 1.23E-05 | 81,500 |
| Washout and flooding | 1.14E-05 | 87,800 |

[1] Incident frequencies are expressed in scientific notation. A value of 2.90E-04 incidents/mile-year is equivalent to 0.00029 incident/mile-year, which is approximately equivalent to one incident every 3,400 years.

## 3.1 Corrosion

Based on PHMSA data (2008), the baseline incident frequency for corrosion-induced leaks is 2.90E-04 incidents/mile-year. For the Project, this baseline frequency was adjusted to account for current industry standard practices and Keystone’s supplemental protective measures. Industry standards currently require frequent internal inspections (at least every 5 years per 49 CFR Part 195), govern material selection on new pipe, and require use of active cathodic protection along the entire pipeline. These industry practices have caused significant reductions in the number of incidents in recent years. To account for the current minimum industry standards using professional engineering judgment, Keystone assigned a 0.3 adjustment factor to the baseline frequency for corrosion.

Keystone will have multiple safeguards in place over and above these current, minimum industry standards to further reduce the likelihood of corrosion-related incidents, including:

- Use of high performance FBE external coating;
- Use of abrasion-resistant coatings for trenchless installation;
- Temperature monitoring and management along the pipeline and at pump stations in order to prevent potential coating damage;
- Installation of a cathodic protection (CP) system and an initial CP survey within 6 months of being placed in service. Additionally, a close interval survey will be performed within 1 year of placing the pipeline in-service and these data will be integrated with in-line inspection data;
- Implementation of alternating current and direct current control program when paralleling high voltage power lines; and
- Conducting high-resolution magnetic flux leakage (MFL) in-line inspections (ILI) as a baseline integrity assessment, within 3 years of the in-service date, and on a periodic reassessment schedule that meets or exceeds federal requirements.

In a new pipeline system, such as this Project, the probability of incident due to corrosion prior to the first MFL inspection is very remote. Utilizing conservative assumptions about corrosion growth rate and feature incidence rate and projecting to the time of baseline inspection, the external corrosion incident probability would be nearly zero. Even with conservative assumptions about growth rate (1 millimeter a month, with a standard deviation of 0.25 millimeter), it would be 15 years before the external corrosion incident probability would become appreciable, in the order of 1E-06 incident/mile-year.

Sediment and water are the largest contributors to internal corrosion risk. Keystone will limit sediment and water by tariff specifications to 0.5 percent by volume and will report compliance with these limitations to PHMSA. The pipeline will not transport crude oil with a sour service designation under NACE MR0175 Part 2, Annex C/CSA Z662. Additionally, cleaning pigs will be run through the line twice in the first year of operation and then as necessary, based on monitoring programs. Cleaning pigs will aid in removing sediment and water, though build-up of these materials is expected to be minimal due to designed turbulent flow within the pipeline. With the baseline MFL inspection occurring 3 years from in-service, the internal corrosion incident probability would be negligible as well.

The corrosion baseline frequency derived from PHMSA data was further reduced to reflect the Keystone supplemental protection measures described above. To account for these supplemental protection measures, and based on professional judgment, an adjustment factor of 0.2 was assigned. Notwithstanding this adjustment, the corrosion-related incident frequency is still considered to be a very conservative estimate of incident probability.

## 3.2 Excavation Damage

Excavation damage leading to pipeline incidents includes damage to the pipe caused by third-parties or pipeline operators. Historically, third-party damage is one of the leading causes of pipeline damage. Operator damage is less frequent because operating safety procedures are required to be followed for all maintenance activities. Consequently, installation of pipelines in sparsely populated areas, adequate depth of cover, use of pipeline markers, and frequent aerial surveillance that looks for excavation activities near or within the pipeline right-of-way, are all factors that minimize the risk of excavation damage and thereby contribute to the overall safety of a pipeline.

Pipelines can leak from third-party damage either due to immediate puncture or through delayed failure from gouging, which is detectable by routine ILI inspections. Since the probability of puncture is dependent on the yield strength and impact toughness of the pipe material, the force required to puncture the pipe can be calculated.

The PHMSA Special Permit requirements are expected to include several key factors designed to reduce the likelihood of impact, which Keystone will implement, including the following:

- Resistance to puncture from an excavator weighing up to 65 tons;
- Depth of cover (4 feet) exceeds regulatory requirements;
- Line-of-sight pipeline markers;
- Common Ground Alliance[3] best practices to be used in damage prevention program;
- One-call system in place; and
- Bi-weekly aerial surveillance.

Using an industry-based reliability model[4], the frequency of a puncture as a result of a pipeline strike can be calculated. The model takes into account the preceding PHMSA conditions and supplemental measures as well as the probability of the pipeline being struck by excavation equipment. In the case of the pipe to be used on the Project, the probability of immediate puncture is very low (less than 5E-06 incidents/ mile-year), as its puncture resistance is in excess of 65 tons and, according to heavy equipment industry surveys, approximately 98 percent of all excavators in North America have a maximum digging force of less than 35 tons and no excavator has a digging force greater than 40 tons (equivalent to an excavator weighing less than 65 tons[5]). State-specific incident frequencies are identified in **Table A-3**.

Based on PHMSA data (2008), the baseline incident frequency for excavation-induced leaks is 1.22E-04 incidents/ mile-year, which includes incidents on all pipeline sizes and year of construction. In comparison, the incident frequency for the Project based on the industry-based reliability model that accounts for impact frequency and the high degree of puncture resistance ranges from 5.87E-06 incidents/mile-year in urban areas to 8.58E-07 in rural, agricultural areas The reduction in incident frequency is best described as an adjustment factor of 0.5 for the reduction in impact frequency due to the excavation mitigation measures listed above, an adjustment factor of 0.1 owing to the high puncture resistance of the pipe, and an adjustment factor of 0.15 in rural areas due to reduced excavation activity.

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[3] Common Ground Alliance is an association of pipeline companies, underground facilities owners, and excavators to address issues related to damage prevention of underground facilities. The group published a full range of safe practices, including the establishment of “One Call” centers; procedures for excavation, mapping, locating and marking; compliance; planning and design; reporting and evaluation; public education and emerging technologies.

[4] Chen, Q. and M. Nessim. “Reliability-based Prevention of Mechanical Damage to Pipelines,” Pipeline Research Council International, Inc. (PRCI), Catalog No. L51816, 1999.

[5] J. Keifner. Impact of 80 percent SMYS Operation on Resistance to Third Party Mechanical Damage. March 21, 2006.

**Table A-3 Excavation Incident Frequencies by State**

| State | Project Length (miles) | High Population Areas | | Other Population Areas | | Other Areas (Agricultural) | | Resultant Failure Frequency |
|---|---|---|---|---|---|---|---|---|
| | | Percent | (miles) | Percent | Miles | Percent | Miles | FF/mile-year |
| Montana | 282.3 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 282.3 | 8.58E-07 |
| South Dakota | 312.8 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 312.8 | 8.58E-07 |
| Nebraska | 255.2 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 255.2 | 8.58E-07 |
| **Total Steele City Segment** | **850.3** | **0.0** | **0.0** | **0.0** | **0.0** | **100.0** | **850.3** | **8.58E-07** |
| Nebraska | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 2.5 | 8.58E-07 |
| Kansas | 211.1 | 0.0 | 0.0 | 0.8 | 1.7 | 99.2 | 209.5 | 8.67E-07 |
| Oklahoma | 82.4 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 82.4 | 8.58E-07 |
| **Total Keystone Cushing Extension** | **296.0** | **0.0** | **0.0** | **0.0** | **1.7** | **100.0** | **296.0** | **8.58E-07** |
| Oklahoma | 154.9 | 0.0 | 0.0 | 2.1 | 3.2 | 97.9 | 151.7 | 8.81E-07 |
| Texas | 323.3 | 0.8 | 2.7 | 1.9 | 6.3 | 97.2 | 314.4 | 8.76E-07 |
| **Total Gulf Coast Segment** | **478.2** | **0.6** | **2.7** | **2.0** | **9.5** | **97.5** | **466.1** | **8.78E-07** |
| **Houston Lateral** | **47.2** | **3.5** | **1.7** | **3.7** | **1.8** | **92.7** | **43.8** | **8.85E-07** |

## 3.3 Materials and Construction

Pipeline incidents associated with materials and construction can be caused by improper selection of materials and lack of quality control and inspection during the manufacturing and construction process. Many of the historical releases contained within PHMSA data set relate to “pre-modern” pipelines where pipeline failures were related to deficiencies in these factors.

Federal regulations currently govern material selection on new pipe and require non-destructive testing (e.g., radiographic or ultrasonic) of 10 percent of the girth welds and hydrostatic testing to 125 percent of MOP. These regulations are designed to detect and remove material defects and construction deficiencies prior to an operational incident. TransCanada has leveraged over 50 years of pipeline operating experience into a complete set of practices for the specification, procurement, transportation, construction, inspection, and quality assurance of any pipeline it constructs. In addition to TransCanada’s proprietary specifications and quality management system , the PHMSA Special Permit is expected to have several conditions related to the manufacture and construction of the pipeline, including:

- Extensive requirements for quality of steel used in manufacture of pipe, over and above the requirements of API 5L Product Specification Level 2 – 44$^{th}$ Edition;
- Comprehensive fracture control plan relating to pipe quality and toughness;
- Extensive inspection of pipe steel and pipe seam;
- Inspection of seam of delivered pipe for signs of seam fatigue from transportation;
- Mill hydrostatic test to 95 percent SMYS;
- Pre-commission hydrostatic test to 100 percent SMYS and 125 percent MOP (in areas at 80 percent SMYS);
- Documentation and quality control of all fittings, flanges and valves;
- Extensive welding quality control requirements, including complete inspection of 100 percent of all girth welds;
- Comprehensive construction quality program; and
- A plan to assess any potential flaw growth after 2 years in service.

Based on PHMSA data (2008), the baseline incident frequency for material defects and construction deficiencies is 3.00E-04 incidents/mile-year. For the Project, this baseline frequency was adjusted to account for current federal regulations and Keystone’s supplemental protective measures. Based on engineering judgment, Keystone assigned a 0.5 adjustment factor to the baseline frequency to account for current federal regulatory requirements, and a further 0.2 adjustment factor to account for Keystone’s supplemental measures, including anticipated Special Permit requirements as listed above, to reduce material defects and construction deficiencies. This is a conservative incident frequency to use, as the effect of complete inspection of 100 percent of all field welded joints and post-construction hydrostatic test to 125 percent MOP would be to remove all near-critical defects, ensuring that an operational incident would be extremely unlikely.

## 3.4 Hydraulic Surge (Incorrect Operations)

Hydraulic events, such as pressure surges (the “water hammer” effect), are caused by sudden changes in flow and can be caused by operator error, failure of pressure controls, or failure of pressure relief equipment.

As part of the requirements expected in a PHMSA Special Permit, several items relating to SCADA control and operator qualification are directly aimed at reducing the likelihood of a pipeline release. These include:

- Overpressure protection to 110 percent of MOP per 49 CFR 195.406(b);
- Increased training for SCADA alarm management and response;
- Use of SCADA pipeline model and simulator, with use of simulator in training, as well as for controller recognition of abnormal operating conditions; and
- Compliance with the requirements of ASME B31Q Pipeline Personnel Qualification Standard, as part of an enhanced training and qualification plan for all SCADA operating personnel, which includes extensive training requirements, qualification and re-qualification procedures.

Hydraulic events can be mitigated by devices that prevent quick stoppages. In an emergency situation, Keystone's SCADA system would allow the operator to shut down the Project in a controlled sequence, with complete shutdown of pump stations and valves occurring in 12 minutes. Prior to operation, the pipeline would be hydrostatically tested to 125 percent of the MOP per federal regulations, providing a safety factor if a hydraulic event occurred. If a hydraulic event occurred on the pipeline, Keystone would be required to report the event to PHMSA, investigate the cause and assess the pipeline to determine if any adverse effects occurred before restarting normal operations.

Based on PHMSA data (2008), the baseline incident frequency for hydraulic events is 1.47E-04 incidents/ mile-year. For the Project, this baseline frequency was adjusted to account for hydraulic controls such as SCADA system, as well as enhanced operator training and response systems. Keystone has committed to comply with industry recommended practices, such as API RP 1165, RP 1130, RP 1162, and ASME B31Q. Based on engineering judgment, Keystone assigned a 0.5 adjustment factor to the baseline frequency to account for all the factors discussed in this section.

## 3.5 Natural Hazard Related

The natural hazard category encompasses several different threats, including earth movement due to geotechnical, landslide or seismic hazards, and flooding (heavy rains or storm surges). The threat of damage from these potential threats also is somewhat dependent upon the pipe's ability to withstand these external forces. Historically, "pre-modern" era pipe had more difficulty dealing with these stresses than modern pipe due to the field welding quality, pipelines using mechanical couplings or threaded joints, lower toughness steel with less fracture control properties, and other factors. Field data show that modern pipe is very robust and more capable of withstanding these external forces than older pipe. Since this hazard cannot be completely eliminated, the susceptibility to outside forces is based upon the percentage of the Project exposed to each type of hazard (**Table A-4** and **Table A-5**).

**Table A-4 PHMSA Seismic Hazard Categories (Project-wide)**

| PHMSA Seismic Risk Category | Seismic Risk | Adjustment Factor | # of Miles Exposed |
|---|---|---|---|
| 0 – 69 | Low | 0.1 | 1,671.7 |
| 69 – 84 | Moderate | 0.8 | 0.0 |
| 84 – 100 | High | 1.0 | 0.0 |

**Table A-5 PHMSA Landslide Hazard Categories (Project-wide)**

| PHMSA Landslide Risk Category | Landslide Risk | Adjustment Factor | # of Miles Exposed |
|---|---|---|---|
| 0 – 69 | Low | 0.1 | 1,230.2 |
| 69 – 84 | Moderate | 0.8 | 71.3 |
| 84 – 100 | High | 1.0 | 370.2 |

### 3.5.1 Ground Movement

Ground movements, such as landslides and seismic events, can threaten the integrity of a pipe. Ground movement is a minor cause of pipeline incidents, accounting for only 1.2 percent of all pipeline incidents. Routing can minimize the exposure of the pipeline to such hazards. In active seismic areas, surface breaking faults and low stability soils (which may liquefy due to seismic shaking) are avoided when practical. To mitigate risk from landslides, steep slopes, which exhibit signs of instability, are avoided when practical. However, it is not always possible to avoid the threat in all cases. In areas susceptible to ground movement, pre-construction engineering and design can minimize the potential effects of ground movement on the pipe. During operations, aerial surveillance will look for signs of any ground movement (e.g., slumping, sloughing, surface fissures, leaning trees), which could be used as indications of slope instability. Areas where ground movement is suspected will be investigated. In some cases, geometric ILI tools may be used to investigate potential ground movement.

Based on PHMSA data (2008), the baseline incident frequency for ground movement events is 1.23E-05 incidents/mile-year. For this Project, this baseline frequency was adjusted to account for regional earthquake and landslide risk (**Table A-6** to **Table A-8**). Seismic and landslide hazards have been plotted on a national scale by the US Geological Survey (USGS) and are available through PHMSA. Seismic and landslide hazards are generally low along the pipeline route, though localized areas exist along some portions of the route. The weighted average factors for landslide and seismic risk results in a project-wide adjustment factor is 0.43.

### 3.5.2 Flooding and Washout

Flooding covers a broad spectrum of potential threats to the line, including storm surges due to hurricanes. PHMSA, in coordination with the USGS, has categorized flooding and hurricane hazard areas and these have been quantified along the Project route (**Table A-9** and **Table A-10**). The most common event is stream scour associated with seasonal flooding. Stream scour occurs when stream velocities are higher than normal, causing erosion of the soil covering the pipeline within the streambed, as well as erosion of the banks of the stream. If the storm scour is severe or the scour area is not remediated, the pipe may eventually become partially or completely exposed. Exposed pipe can be susceptible to a number of hazards, such as fatigue due to vortex shedding (where a long span is exposed), loading due to debris pile up (material transported down the stream), or damage due to impacts from falling debris or passing boats. To reduce these potential hazards, steps are taken at the design phase to determine the scour depth of a stream, as well as its potential for bank erosion, and including factors such as thalweg depth and bankfull conditions in a rare event flood (e.g., a 1-in 100-year flood event).

Keystone will conduct a scour analysis at stream crossings susceptible to scour. Where stream scour may be an issue, the Project will be buried at depths below the anticipated scour depth. Based on PHMSA data (2008), the baseline incident frequency for washout and flooding events is 1.14E-05 incidents/mile-year. For

**Table A-6 Seismic Hazard Quantification for the Project (by State)**

| State | Project Length (miles) | Earthquake Risk Factor – Percent | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 – 69 | | 70 – 84 | | 85 – 100 | |
| | | Percent | Miles | Percent | Miles | Percent | Miles |
| Montana | 282.3 | 100.0 | 282.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| South Dakota | 312.8 | 100.0 | 312.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Nebraska | 255.2 | 100.0 | 255.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Steele City Segment** | **850.3** | **100.0** | **850.3** | **0.0** | **0.0** | **0.0** | **0.0** |
| Nebraska | 2.5 | 100.0 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Kansas | 211.1 | 100.0 | 211.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Oklahoma | 82.4 | 100.0 | 82.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Cushing Extension** | **296.0** | **100.0** | **296.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| Oklahoma | 154.9 | 100.0 | 154.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| Texas | 323.3 | 100.0 | 323.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Gulf Coast Segment** | **478.2** | **100.0** | **478.2** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Houston Lateral** | **47.2** | **100.0** | **47.2** | **0.0** | **0.0** | **0.0** | **0.0** |

**Table A-7 Landslide Hazard Quantification for the Project (by State)**

| State | Project Length (miles) | Landslide Risk Factor – Percent | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 – 69 | | 70 – 84 | | 85 – 100 | |
| | | Percent | Miles | Percent | Miles | Percent | Miles |
| Montana | 282.3 | 62.0 | 175.1 | 2.0 | 5.6 | 36.0 | 101.6 |
| South Dakota | 312.8 | 30.9 | 96.6 | 4.6 | 14.3 | 64.5 | 201.8 |
| Nebraska | 255.2 | 90.3 | 230.5 | 2.0 | 5.1 | 7.7 | 19.6 |
| **Total Steele City Segment** | **850.3** | **59.1** | **502.2** | **2.9** | **25.0** | **38.0** | **323.0** |
| Nebraska | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 2.5 |
| Kansas | 211.1 | 91.7 | 193.7 | 5.0 | 10.6 | 3.3 | 6.9 |
| Oklahoma | 82.4 | 100.0 | 82.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Cushing Extension** | **296.0** | **93.3** | **276.0** | **3.6** | **10.6** | **3.2** | **9.4** |
| Oklahoma | 154.9 | 91.1 | 141.1 | 4.3 | 6.6 | 4.6 | 7.1 |
| Texas | 323.3 | 81.5 | 263.6 | 9.0 | 29.0 | 9.5 | 30.6 |
| **Total Gulf Coast Segment** | **478.2** | **84.6** | **404.7** | **7.5** | **35.7** | **7.9** | **37.8** |
| **Houston Lateral** | **47.2** | **100.0** | **47.2** | **0.0** | **0.0** | **0.0** | **0.0** |

**Table A-8 Ground Movement Incident Frequencies (by State)**

| State | Length (miles) | Weighted Adjustment Factor (Seismic) | Weighted Adjustment Factor (Landslide) | Relative Incident Frequency /mi-yr (Ground Movement Total) |
|---|---|---|---|---|
| Montana | 282.3 | 0.10 | 0.44 | 6.62E-06 |
| South Dakota | 312.8 | 0.10 | 0.71 | 1.00E-05 |
| Nebraska | 255.2 | 0.10 | 0.18 | 3.48E-06 |
| **Total Steele City Segment** | **850.3** | **0.10** | **0.46** | **6.92E-06** |
| Nebraska | 2.5 | 0.10 | 1.00 | 1.35E-05 |
| Kansas | 211.1 | 0.10 | 0.16 | 3.25E-06 |
| Oklahoma | 82.4 | 0.10 | 0.10 | 2.46E-06 |
| **Total Cushing Extension** | **296.0** | **0.10** | **0.15** | **3.12E-06** |
| Oklahoma | 154.9 | 0.10 | 0.17 | 3.34E-06 |
| Texas | 323.3 | 0.10 | 0.25 | 4.28E-06 |
| **Total Gulf Coast Segment** | **478.2** | **0.10** | **0.22** | **3.98E-06** |
| **Houston Lateral** | **47.2** | **0.10** | **0.10** | **2.46E-06** |

**Table A-9 PHMSA Flood Risk Categories (Project-wide)**

| PHMSA Flood Risk Category | Flood Risk | Adjustment Factor | # of Miles Exposed |
|---|---|---|---|
| 0 – 69 | Low | 0.1 | 975.7 |
| 69 – 84 | Moderate | 0.8 | 361.4 |
| 84 – 100 | High | 1.0 | 334.6 |

**Table A-10 PHMSA Hurricane Risk Categories (Project-wide)**

| PHMSA Hurricane Risk Category | Hurricane Risk | Adjustment Factor | # of Miles Exposed |
|---|---|---|---|
| 0 – 84 | Low | 0.1 | 1,418.5 |
| 84 – 100 | High | 1.0 | 253.2 |

this Project, this baseline frequency was adjusted to account for regional flood risk, depth of cover, and Keystone's preventative measures such as scour analysis to ensure the pipe is buried sufficiently below the streambed (**Table A-11** to **Table A-13**). The weighted average factor for flooding and hurricane risk results in a project-wide adjustment factor of 0.67.

**Table A-11 Flooding Hazard Quantification for the Project (by State)**

| State | Length (miles) | Flood Risk Factor – Percent | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 – 69 | | 70 – 84 | | 85 – 100 | |
| | | Percent | Miles | Percent | Miles | Percent | Miles |
| Montana | 282.3 | 73.4 | 207.3 | 18.8 | 53.0 | 7.8 | 21.9 |
| South Dakota | 312.8 | 70.1 | 219.4 | 22.2 | 69.4 | 7.7 | 24.0 |
| Nebraska | 255.2 | 88.5 | 225.9 | 7.0 | 17.8 | 4.5 | 11.5 |
| **Total Steele City Segment** | **850.3** | **76.8** | **652.6** | **16.5** | **140.2** | **6.8** | **57.5** |
| Nebraska | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 2.5 |
| Kansas | 211.1 | 14.3 | 30.1 | 36.1 | 76.3 | 49.6 | 104.7 |
| Oklahoma | 82.4 | 20.3 | 16.7 | 43.8 | 36.1 | 35.9 | 29.6 |
| **Total Cushing Extension** | **296.0** | **15.8** | **46.9** | **38.0** | **112.4** | **46.2** | **136.8** |
| Oklahoma | 154.9 | 43.8 | 67.8 | 23.0 | 35.7 | 33.2 | 51.4 |
| Texas | 323.3 | 55.9 | 180.8 | 20.2 | 65.2 | 23.9 | 77.4 |
| **Total Gulf Coast Segment** | **478.2** | **52.0** | **248.6** | **21.1** | **100.8** | **26.9** | **128.8** |
| **Houston Lateral** | **47.2** | **58.5** | **27.6** | **16.8** | **7.9** | **24.6** | **11.6** |

**Table A-12 Hurricane Hazard Quantification for the Project (by State)**

| State | Length (miles) | Hurricane Risk Factor – Percent | | | |
|---|---|---|---|---|---|
| | | 0 – 84 | | 85 – 100 | |
| | | Percent | Miles | Percent | Miles |
| Montana | 282.3 | 100.0 | 282.3 | 0.0 | 0.0 |
| South Dakota | 312.8 | 100.0 | 312.8 | 0.0 | 0.0 |
| Nebraska | 255.2 | 100.0 | 255.2 | 0.0 | 0.0 |
| **Total Steele City Segment** | **850.3** | **100.0** | **850.3** | **0.0** | **0.0** |
| Nebraska | 2.5 | 100.0 | 2.5 | 0.0 | 0.0 |
| Kansas | 211.1 | 100.0 | 211.1 | 0.0 | 0.0 |
| Oklahoma | 82.4 | 100.0 | 82.4 | 0.0 | 0.0 |
| **Total Cushing Extension** | **296.0** | **100.0** | **296.0** | **0.0** | **0.0** |
| Oklahoma | 154.9 | 100.0 | 154.9 | 0.0 | 0.0 |
| Texas | 323.3 | 36.3 | 117.3 | 63.7 | 206.0 |
| **Total Gulf Coast Segment** | **478.2** | **56.9** | **272.2** | **43.1** | **206.0** |
| **Houston Lateral** | **47.2** | **0.0** | **0.0** | **100.0** | **47.2** |

**Table A-13 Flooding and Hurricane Incident Frequency by State**

| State | Length (miles) | Weighted Adjustment Factor (Flood) | Weighted Adjustment Factor (Hurricane) | Relative Incident Frequency (Flooding and Hurricane) |
|---|---|---|---|---|
| Montana | 282.3 | 0.30 | 0.10 | 4.58E-06 |
| South Dakota | 312.8 | 0.32 | 0.10 | 4.84E-06 |
| Nebraska | 255.2 | 0.19 | 0.10 | 3.30E-06 |
| **Total Steele City Segment** | **850.3** | **0.28** | **0.10** | **4.29E-06** |
| Nebraska | 2.5 | 1.00 | 0.10 | 1.25E-05 |
| Kansas | 211.1 | 0.80 | 0.10 | 1.03E-05 |
| Oklahoma | 82.4 | 0.73 | 0.10 | 9.46E-06 |
| **Total Cushing Extension** | **296.0** | **0.78** | **0.10** | **1.01E-05** |
| Oklahoma | 154.9 | 0.56 | 0.10 | 7.52E-06 |
| Texas | 323.3 | 0.46 | 0.67 | 1.29E-05 |
| **Total Gulf Coast Segment** | **478.2** | **0.49** | **0.49** | **1.11E-05** |
| **Houston Lateral** | **47.2** | **0.44** | **1.00** | **1.64E-05** |

# 4.0 Conclusion

This study was completed to provide conservative incident frequency values for the purposes of estimating the environmental risks for the Project. The pertinent threats were identified, analyzed, and incident frequencies were calculated.

The estimated incident frequency is based on conditions when the pipeline is placed into service. Although the risk from time-dependent threats may change over time, Keystone believes that the analysis will remain conservative and applicable for the service life of the project and beyond for the following reasons:

- The analysis is based on historical data. Analysis of these data demonstrates a marked decline in pipeline incident rates over the last 10 years, primarily due to a reduction in corrosion-related events. The decline is attributed to the industry's increased use of in-line inspection tools, improved coatings, and use of cathodic protection.
- The analysis is based on a historical database where the majority of pipe is 'pre-modern' construction. Because of improving steel quality and properties, construction practices and inspection requirements, pipelines installed today will have much lower incident frequencies than pre-modern pipes.
- The adjustment factors are conservative and the analysis therefore overestimates actual risk even over a period of decades.
- Industry best management practices and the regulatory environment will continue to evolve, resulting in improved inspection and protection of pipelines. As a consequence, there will be a continued decline in the frequency of pipeline incidents.

For each state, the overall incident frequency was calculated by summing the likelihood of each individual root cause.

$$f_{total} = f_{co} + f_{ex} + f_{md} + f_{hy} + f_{gm} + f_{wo}$$

Where:

$f_{total}$ = total leak frequency

$f_{co}$ = leak frequency from corrosion

$f_{ex}$ = leak frequency from excavation

$f_{md}$ = leak frequency from material defects or construction deficiency

$f_{hy}$ = leak frequency from a hydraulic event

$f_{hy}$ = leak frequency from ground movement

$f_{wo}$ = leak frequency from washout event

The resultant state-specific incident frequencies are summarized in **Table A-14**. Based on a weighted average of the state-specific incident frequencies, the resultant project-wide leak frequency is 1.35E-04 incidents/mile-year, equivalent to one incident in 7,400 years per mile of pipe.

**Table A-14 Incident Frequencies by State**

| State | Length (miles) | Incident Frequency | Occurrence Interval (years) |
|---|---|---|---|
| Montana | 282.3 | 1.33E-04 | 7,500 |
| South Dakota | 312.8 | 1.37E-04 | 7,300 |
| Nebraska | 255.2 | 1.29E-04 | 7,800 |
| **Steele City Segment** | **850.3** | **1.33E-04** | **7,500** |
| Nebraska | 2.5 | 1.48E-04 | 6,800 |
| Kansas | 211.1 | 1.35E-04 | 7,400 |
| Oklahoma | 82.4 | 1.34E-04 | 7,500 |
| **Cushing Extension** | **296.0** | **1.35E-04** | **7,400** |
| Oklahoma | 154.9 | 1.33E-04 | 7,500 |
| Texas | 323.3 | 1.39E-04 | 7,200 |
| **Gulf Coast Segment** | **478.2** | **1.37E-04** | **7,300** |
| **Houston Lateral** | **47.2** | **1.41E-04** | **7,100** |
| **Project-wide (including Keystone Cushing Extension)** | **1671.7** | **1.35E-04** | **7,400** |

# 5.0 Spill Volumes

## 5.1 Methodology

Keystone has evaluated maximum spill volumes that could potentially occur along the Project for the purpose of emergency response planning. This approach is consistent with the requirements of 49 CFR Section 194.105, which requires an operator to determine the worst-case discharge of each of its emergency response zones. The worst-case discharge is defined as the largest volume based on the maximum release time, maximum shut down response time, maximum flow rate and the largest line drainage volume after shut down of the line section within the response zone. This section describes the methodology used to estimate maximum spill volumes for the Project.

## 5.2 Leak Detection

In an event of a leak or rupture, Keystone would implement multiple leak detection methods and systems that are overlapping in nature and progress through a series of leak detection thresholds. The leak detection methods are as follows:

- Remote monitoring performed by the OCC Operator, which consists of monitoring pressure and flow data received from pump stations and valve sites fed back to the OCC by the Keystone SCADA system. Remote monitoring is typically able to detect leaks down to approximately 25 to 30 percent of the pipeline flow rate.
- Software-based volume balance systems that monitor receipt and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of the pipeline flow rate.
- Computational Pipeline Monitoring or model-based leak detection systems that break the pipeline into smaller segments and monitor each of these segments on a mass balance basis. These systems are typically capable of detecting leaks down to a level of approximately 1.5 to 2 percent of pipeline flow rate.
- Computer-based, non-real time accumulated gain/(loss) volume trending to assist in identifying low rate or seepage releases below the 1.5 to 2 percent by volume detection thresholds.
- Direct observation methods, which include aerial patrols, ground patrols, and public and landowner awareness programs that are designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline.

While large, rapid releases are quickly detected, a pinhole leak with a slow rate of release may not be immediately detected by the first four detection mechanisms above, and patrolling and public awareness may be the first to detect these small leaks. PHMSA data indicate that pipeline spills are usually detected within 1.2 days and 97 percent of spills are detected within 7 days (PHMSA 2008). Even when leaks were not detected within the first 48 hours, PHMSA data indicate that the total spill volumes were not catastrophic, rather the median total spill volume for spills not detected within the first 48 hours was 15 barrels, and the maximum spill volume was 12,000 barrels (detected after 4 days).

## 5.3 Methodology

The total spill volume is based on three leak duration periods:

- The pre-pump-closure period,
- The pre-valve-closure period and,
- After-valve-closure period.

Prior to the pump shut-down sequence to stop the pipeline in the event of a release, the pressure in the pipeline can be estimated through well-defined friction loss equations in combination with gravity head calculations. The total volume released before pump shut-off is the culmination of a constant leak rate over the duration of a leak.

After pump shutdown, the intermediate mainline valves will require a few minutes to close; where a check valve is installed, this type of valve enables "immediate one-way" closure of the valves after pump shut down to prevent backflow caused by gravity drainage. After pump shutdown, the liquid could drain out of the line under the gravity head difference between the leak and the adjacent elevated pipeline segments. This free draining process is modeled as a multi-loop "U" tube, with the middle open to the atmosphere and the other two ends connected to up and downstream valves. This concept is illustrated in **Figure A-2**.

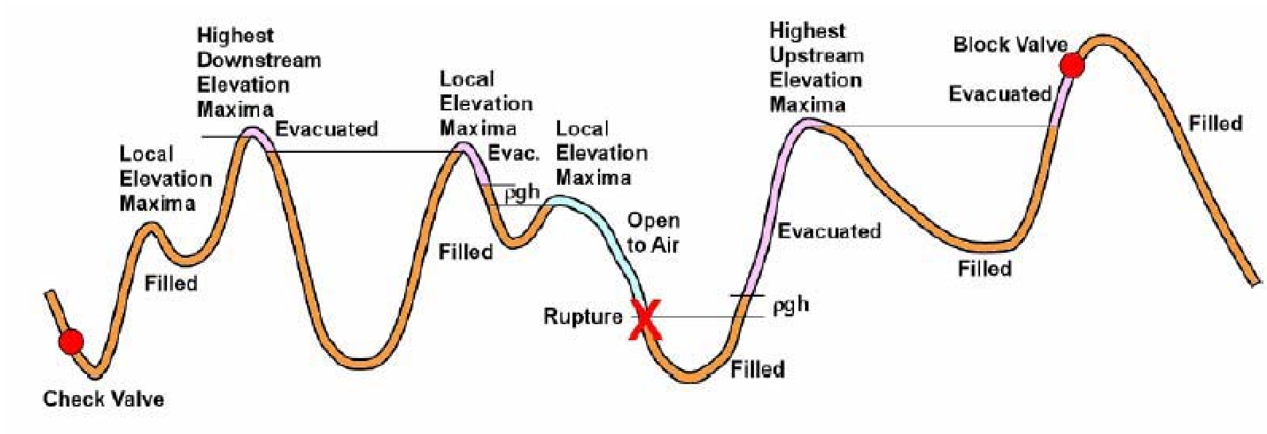


**Figure A-2 Schematic of Drained Segments after Valve Closure**

There are three ways draindown can occur depending upon the proximity of the segments to the leak location:

1. If a leak is in proximity upstream or downstream from an adjacent segment with a higher elevation than the leak location, the segment will be fully drained. On the other hand, if the adjacent segment elevation is lower than the leak location, the first segment will still be filled with liquid in the line.

2. In situations where vapor pressure can be assumed to be zero there must be a liquid segment of height with equivalent pressure of *pgH*[6] to balance atmospheric pressure. If there isn't enough elevation above this height, there will be no further drain-down. If there are segments that have more than *ghρ* equivalent pressure, then more segments in the line will be drained. In this case, the second drained segment immediately adjacent to the first drained segment will be at least "H" above the first drained segment. In situations where vapor pressure is considered, a conservative approach is used to assume there is no head (*pgH*) balancing atmospheric pressure.

---

[6] See Section 6.4 for equation defining "*pgH.*"

3. In addition, adjacent to the second drained segments, the pressure is only balanced by the vacuum. Therefore, the elevation of the one end of the drained segment will be the same as the other end of the previous drained segment. This scenario will be the same for any further drained segments.

Before pump-closure, the leak volume is the leak rate computed from the Bernoulli equation, where pressure is the result of local gravity and operating pressure. After pump shut-off but before valve closure, drainage is calculated using the whole pipeline including check valves, (which prevent backflow). This period is relatively short compared to the after-valve-closure period. Given that all the segments of the whole pipeline can possibly drain down without valve restrictions, the drainage process needs to be considered as time-dependent. This consideration is especially important for small leak sizes, because within the response time of closing the valves, a limited number of segments are susceptible to drainage based on the Bernoulli equation. The time dependent-manner of this drainage is caused by reduced gravity head along with the draining process. This draining needs to satisfy the following equation:

At any time (*t*):

$$\rho g H = {}^{1}\!/_{2}\, \rho v^{2}$$

Where:

- $H$ = the maximum relative elevation above the leak in the pipeline at instant $t$
- $g$ = gravity acceleration
- $\rho$ = fluid density

After a short time interval, *H* is reduced and is recomputed based on the leak rate (*v*) for each time interval. This calculation uses the drained volume, which is measured using the cross sectional area of the pipe, the average slope of the draining segments, and the number of U-tube sections being drained: sections with elevations higher than the fluid level at time *t*.

The maximum fluid level above the leak is updated after each time interval to the Bernoulli equation to compute the updated leak velocity. This process is iterated until total time is elapsed when pump shutdown exceeds the valve closure response time and the total drained down volume is computed by this time.

After all the valves are closed, the liquid drainage only occurs between the two nearest block valves. The analysis also can be considered similar to the aforementioned scenario but the volume drainage analysis is confined between two adjacent valves that enclosed the leak location. However, a conservative and simpler approach is to assume that the leak cannot be stopped in time and all oil that should be drained down will be freely drained out of the pipeline. This simplification eliminates the need to do iterative calculations described above.

The release volumes from the above three phases can be combined to produce a total outflow volume for the overland spill model simulations. Repeating these calculations at multiple points along the pipeline can identify areas of greatest concern in accordance with federal requirements and evaluate the effectiveness of valve placement for the protection of HCAs.

## 5.4 Spill Scenarios

Keystone estimated maximum spill volumes based on three scenarios: worse case discharge, large leak, and a small leak. These maximum spill volumes were calculated using the outflow model described above. Maximum spill volumes estimated for the Project for each scenario described below are presented by state, segment, and project-wide. Based on historical averages, spills of these proportions are rare. Nevertheless, Keystone will be prepared to respond to spills of any size in accordance with Federal requirements.

### 5.4.1 Worst-Case Discharge Scenario

For this scenario, a worst-case discharge (rupture) was defined as a hole in the pipeline with a diameter equal to the pipeline's diameter. In this case, as the release rate from the rupture will be similar to the operating flow rate, the leak detection system will detect the leak virtually instantaneously due to the pressure drop in the line. Following detection, an emergency shutdown procedure is initiated, with pumps shutting down first (9 minutes for shutdown), followed by approximately 3 minutes for intermediate remotely operated valve closure.

### 5.4.2 Large Leak Scenario

For this scenario, a large leak is defined as one that results from a hole having a mean diameter of 1.96 inches. The mean diameter for this scenario is based on conservative geometry of an injurious flaw that would cause a leak of this nature. The leak detection system will detect this leak, as it will be a significant fraction of the normal operating flow rate. Following initial detection of a potential leak, the OCC would confirm the leak and begin a controlled system shutdown.

### 5.4.3 Small Leak Scenario

A small leak is defined as one that results from a hole having a mean diameter of 0.06-inch. As the release rate will be a very small percentage of the flow rate, the computational leak detection systems would not detect the leak immediately The leak in this scenario would be more likely detected by line patrol or reported by a third-party. If the leak remained undetected by direct observation for an extended period of time, the computational leak detection systems could detect such a leak. Following notification and confirmation of a leak, the OCC would begin a controlled system shutdown.

### 5.4.4 Spill Size Distribution

**Figure A-3** provides a view of the spill size distribution. The cumulative distribution of spill volumes is based on simulated spills at approximately 3 foot intervals along the pipeline. Fifty percent of all spills modeled are less than 16,000 bbls and only 0.1 percent of all spills modeled are greater than 66,500 bbls.

## 5.5 Comparison of Worst-case Spill Volumes with Actual Spill Volumes

Examination of the current PHMSA dataset (2002 to June 2008) indicates that the vast majority of pipeline spills are relatively small, with 50 percent of the spills consisting of 3.0 barrels or less (**Table A-15**). In 85 percent of the cases, the spill volume was 100 barrels or less. In over 95 percent of the cases, spill volume was less than 1,000 barrels. Oil spills of 10,000 barrels or greater only occurred in 0.5 percent of cases. These data demonstrate that most pipeline spills are small and very large releases of 10,000 barrels or more are extremely uncommon.

While the majority of historical pipeline spills have been relatively small, it is critical to evaluate worst-case spill scenarios for the purposes of design refinement (e.g., placement of valves) and emergency pre-planning purposes, allowing for optimal valve placement and pre-positioning of personnel and equipment.

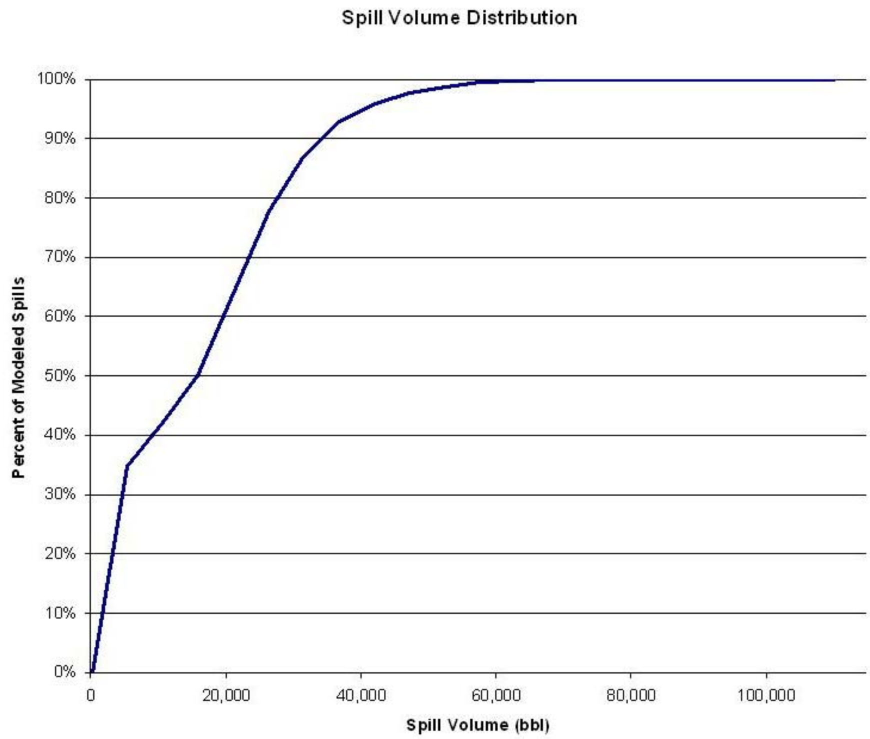


**Figure A-3 Spill Volume Distribution**

**Table A-15 Historical Spill Volumes Based on the PHMSA Database (2002-2009)**

| | **Spill Volume (barrels)** |
|---|---|
| Mean (barrels) | 296 |
| Median (barrels) | 3.0 |
| Minimum (barrels) | 0.0 |
| Maximum (barrels) | 49,000 |

## 5.6 Conclusion

Spill volume data from actual pipeline incidents reported between 2002 and 2008 shows that the majority of spills consist of only 3 barrels or less (PHMSA 2008). In contrast, Keystone is estimating maximum spill volumes to prepare for the worst-case scenario. These maximum spill volumes will be used for emergency planning purposes, such as the identification of the amount of equipment and resources that could be potentially required to respond to an event. Keystone also will use these data combined with fate and transport analyses to pre-position emergency response personnel and their response equipment. In the unlikely event of a spill, the actual size of a spill is expected to be significantly smaller than the maximum spill volume.

# 6.0 References

Chen, Q. and M. Nessim. 1999. “Reliability-based Prevention of Mechanical Damage to Pipelines,” Pipeline Research Council International, Inc. (PRCI), Catalog No. L51816, 1999.

Pipeline and Hazardous Materials Safety Administration (PHMSA). 2008. PHMSA Pipeline Incident Statistics. Website: http://primis.phmsa.dot.gov/comm/reports/safety/PSI.html.

# APPENDIX R

## Construction/Reclamation Plans and Documentation

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# 1. Construction/Reclamation (Con/Rec) Units

# Construction/Reclamation (Con/Rec) Units

## Cropland

Farmed cropland includes areas of agricultural production that are tilled either annually or occasionally. Agricultural products include wheat, corn, milo, oats, soybeans, and alfalfa. Cropland occurs on all spreads throughout the Keystone XL Project. Primary areas include central Montana, central and southern South Dakota, and southern Nebraska. Based on these descriptions construction recommendations and reclamation recommendations were developed.

## Conservation Reserve Program

Lands enrolled in the Conservation Reserve Program (CRP) under contract with the USDA Farm Service Agency. Landowners convert erodible or environmentally sensitive acreage to native grasses or introduced grasses and forbs, wildlife plantings, trees, or riparian buffers per the terms of a multiyear contract. The unit locations are scattered throughout the project. Refer to Alignment Sheets and/or Keystone field verification for specific locations.

## Forest

Forest areas are dominated by native and introduced trees. Typical species include green ash, boxelder, plains cottonwood, elm, oak, mulberry, and eastern red cedar. In northern areas this unit is primarily located on floodplains, in deep draws, and on steeper slopes. In southern areas of the project the unit may also occur on flat topography and along roads and fencelines.

## Improved Pasture and Hayland

Improved pastures and haylands are managed grasslands that have typically been planted with grasses for livestock forage or hay production. Improved pastures and haylands are often dominated by crested wheatgrass, smooth brome and legumes in various combinations, or seeded native tall grasses, depending on Project location. Improved pastures and haylands occur on all spreads throughout the Keystone XL Project area.

## Mixed Grasslands

Mixed grasslands are dominated by native perennial grasses such as western wheatgrass, needle-and-thread, blue grama, Sandberg bluegrass, prairie junegrass, little bluestem, prairie sandreed, green needlegrass and bluebunch wheatgrass. Mixed grasslands are dominated by native perennial grasses such as western wheatgrass, needle-and-thread, blue grama, Sandberg bluegrass, prairie junegrass, little bluestem, prairie sandreed, green needlegrass and bluebunch wheatgrass.

## Riparian

Riparian woodlands include forested and shrub dominated areas around streams and rivers. Common trees and shrubs include plains cottonwood, green ash, box elder, Russian olive, sandbar willow, Wood’s rose, snowberry, and silver sagebrush. Herbaceous under stories are often dominated by Kentucky bluegrass, western wheatgrass, and redtop. Primarily located on floodplains and terraces along streams and rivers, this Con/Rec Unit is relatively limited on the Keystone XL Project.

### Shelterbelt

Planted tree and shrub shelterbelts and windbreaks. Common northern species are: plains cottonwood, Chinese elm, American elm, Austrian pine, Siberian peashrub, and lilac. Common southern species are: Osage orange, eastern red cedar, locust, and hawthorne. Typically located at field margins, near roadsides, or around residences. Refer to Alignment Sheets and/or Keystone field verification for specific locations.

### Sandy Prairie

Native prairie on sandy soils dominated primarily by warm- season grasses such as little bluestem, sand bluestem, prairie sandreed, and switchgrass. Topography is typically flat to gently rolling. The Sandy Prairie unit occurs in southern South Dakota and northern Nebraska. The unit is interspersed with hay meadows and crop land.

### Tall Grasslands

Tall grasslands are dominated by tall warm-season grass species including big bluestem, switchgrass, Indiangrass, and little bluestem, and shorter warm season grasses such as blue grama and sideoats grama. Tall grasslands occur in southern South Dakota and throughout Nebraska in areas that are not farmed or a part of the Sandy Prairies. Many of the grass species within the Con/Rec Unit are the same as those occurring within the Sandy Prairies and subirrrigate prairie Con/Rec Units, but topography, soil type, and hydrology differ between those types and this unit.

### Subirrigated Pasture

The Subirrigated Pasture type includes subirrigated plains and hay meadows. Soils are typically fine sands, with narrow clay bands in some areas. Topography is typically flat. The water table within this Con/Rec Unit is often within six feet of the surface. Native grasses include big bluestem, switchgrass, and little bluestem; introduced grasses include timothy, orchardgrass, and Kentucky bluegrass . Wetlands may occur adjacent to, but not part of, this Con/Rec Unit. Subirrigated Pastures occur in southern South Dakota and portions of Nebraska, primarily in Tripp, Keya Paha, Rock, Holt, Antelope, and Nance counties.

### Reclamation of Contractor Camps, Pipeyards, and Contractor Yards

Contractor camps, contractor yards, pipe storage yards, staging areas, and other temporary facilities. Several yards and facilities are associated with each construction Spread. Refer to project maps for exact location.

Con/Rec units and their descriptions are not tied to either the land use categories or vegetation cover described elsewhere in this SER. They are not intended to replace either, but is a tool to provide the construction contractor with specific measures to implement for the land uses/vegetative cover encountered along the route. The surveys and results for the FEIS route with surveys for the new route will be conducted prior to construction.

| Table H-1 Construction/Reclamation Unit Development Timeline | | |
|---|---|---|
| **Date** | **Item** | **Outcome** |
| Summer 2008 | Began initial agency and university contact regarding reclamation in Nebraska, primarily in the Sand Hills. | Obtained expert advice regarding topsoil salvage, erosion control, and revegetation seed mixtures. |
| Summer 2009 | Completed construction/ reclamation survey along the proposed route within the Sand Hills. | Rerouted centerline to avoid excessively steep slopes and ridges. Rerouted centerline to place project in soil accumulation areas such as valleys and swales rather than areas prone to scour to the extent possible. Identified primary native species growing within the Sand Hills and mapped noxious weeds. Mapped slopes and topsoil depths and designed erosion control specific to the topography. |
| Fall 2009 | Completed additional construction/ reclamation survey on the remainder of the proposed route in Nebraska | Mapped areas of native grassland, pasture, cropland, shelterbelts, and wet meadows. Mapped slopes, noxious weeds, typical topsoil depths, and land use features. |
| Winter 2009 | Initiated contact with Farm Service Agency (FSA) to obtain location and information on Conservation Reserve Program (CRP) tracts. | Obtained signed landowner permission to collect CRP data on their land through the FSA. Submitted a formal request to FSA for CRP locations, conservation practices, and revegetated seed mixtures in Spring 2011. Obtained CRP locations and data Spring 2012. |
| Summer 2010 | Met with state NRCS State Resource Conservationist and State Soil Scientist in Lincoln to discuss and review construction/ reclamation units. | Productive meeting. NRCS suggested revisions to soil salvage depths for Sand Hills soil types and made minor revisions to the revegetation seed mixtures. |
| Summer 2010 | Completed landowner sponsored site visit of Sand Hills. Attendees included local landowners, county NRCS agents, UNL extension professionals, and Keystone representatives. | Reviewed construction/reclamation methods in the Sand Hills and other parts of Nebraska. Presented slide show on pipeline construction and reclamation. Reviewed construction/reclamation units with local agency and UNL personnel and slightly revised seed mixtures per agency recommendations. |
| Summer 2011 | Responded to U.S. Fish and Wildlife Service and Nebraska Game Fish and Parks Commission request to use local ecotype seed for revegetation within Sand Hills and Marsh Plains on the project. | Contacted 20 seed large and small seed contractors in the Midwest and Great Plains to determine if local ecotype seed could be collected in enough quantity and of high enough quality to meet revegetation requirements and landowner expectations. Less than 2% of the required seed was available at the time or could be obtained in the future from local ecotypes. |
| Fall 2011 | Met with USFWS, NGPC, UNL, state level NRCS, DOS, and Keystone representatives to resolve question of local ecotype seed. | Determined a list of native grass seed varieties in order of preference based on the proximity of the variety to the project. Revised seed mixtures to reflect seed preference. |

| Table H-1 Construction/Reclamation Unit Development Timeline | | |
|---|---|---|
| **Date** | **Item** | **Outcome** |
| | | Determined that local ecotype seed was not available in enough quantity or quality, or with enough reliability to meet revegetation requirements and landowner expectations. |
| Spring/Summer 2012 | Completed construction/reclamation surveys on the preferred Nebraska reroute as well as numerous route variations. | Mapped areas of native grassland, pasture, cropland, shelterbelts, and wet meadows. Mapped slopes, noxious weeds, typical topsoil depths, and land use features. |

**Table H-2 Surveyed Mileage of Construction/Reclamation Types on Nebraska FEIS Route**

| Construction/Reclamation | Miles |
|---|---|
| Cropland | 149.5 |
| Conservation Reserve Program | 3.7 |
| Forest | 1.8 |
| Improved Pasture/Hayland | 15.7 |
| Mixed Grassland | 3.9 |
| Un-surveyed Preferred Route | 90.1 |
| Riparian | 0.4 |
| Sandy Prairie | 3.0 |
| Shelterbelt | 1.1 |
| Subirrigated Pasture | 1.2 |
| Tall Grassland | 2.9 |

# 2. Construction/Reclamation (Con/Rec) Unit Specifications

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: CROP**
**KEYSTONE XL**

| | |
|---|---|
| **UNIT NAME:** | **CROPLAND** |
| **UNIT CODE:** | **CROP** |
| **UNIT DESCRIPTION:** | Farmed cropland includes areas of agricultural production that are tilled either annually or occasionally. Agricultural products include wheat, corn, milo, oats, soybeans, and alfalfa. |
| **UNIT LOCATION:** | Cropland occurs on all spreads throughout the Keystone XL Project. Primary areas include central Montana, central and southern South Dakota, and southern Nebraska. |
| **UNIT GOALS:** | • Maintain soil productivity and prevent accelerated erosion. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone's satisfaction. |
| **SPECIAL CONSIDERATIONS:** | **1.** Agricultural terraces may be present within this Con/Rec Unit and will be reconstructed as directed by Keystone.<br>**2.** Seeding will be completed by the Landowner unless otherwise directed by Keystone. |

**CONSTRUCTION**

| | |
|---|---|
| **ROW WIDTH:** | Typically 110 feet. |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone.<br>**B.** The typical topsoil salvage depth is 6 – 12 inches. |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. |

**RECLAMATION**

| | |
|---|---|
| **SEEDBED PREPARATION:** | Prepare seedbed as specified in the CMRP.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 3-4 inches in diameter to aid in wind and water erosion control, and if not being seeded by Keystone. |
| **SEEDING METHOD, SEED MIX AND RATE:** | Seeding will be completed by the Landowner unless otherwise directed by Keystone. If the potential for erosion is high, an annual cover crop may be seeded as directed by Keystone. |
| **SEEDING DATE:** | Not applicable. |
| **MULCHING AND MATTING:** | Mulching and matting will typically not be completed within this Con/Rec Unit. If the potential for erosion is high, an annual cover crop or mulching may be required as directed by Keystone. |
| **SLOPE AND TRENCH BREAKERS:** | Slope breakers will typically not be constructed within this Con/Rec Unit. Trench breakers will be constructed where directed by Keystone.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Reconstruct agricultural terraces as described in the CMRP and as directed by Keystone. |

**MANAGEMENT PRACTICES**

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner if necessary.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor soil stability post construction.

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: CRP**
**KEYSTONE XL**

| | | |
|---|---|---|
| **UNIT NAME:** | **CONSERVATION RESERVE PROGRAM** |  |
| **UNIT CODE:** | **CRP** | |
| **UNIT DESCRIPTION:** | Lands enrolled in the Conservation Reserve Program (CRP) under contract with the USDA Farm Service Agency. Landowners convert erodible or environmentally sensitive acreage to native grasses or introduced grasses and forbs, wildlife plantings, trees, or riparian buffers per the terms of a multi-year contract. | |
| **UNIT LOCATION:** | Scattered throughout Project. Refer to Alignment Sheets and/or Keystone field verification for specific locations. | |
| **RECLAMATION GOALS:** | • Restore topography similar to adjacent conditions. • Insure that lands enrolled in the CRP program are reseeded with appropriate seed mix and that lands remain eligible for enrollment in the CRP program. • Prevent erosion. • Adequately decompact soil. • Complete all work to standards specified by CMR Plan, contract documents and details, applicable permits, Keystone's satisfaction, and per the FSA/Landowner contract. | |

**CONSTRUCTION**

| | |
|---|---|
| **ROW WIDTH:** | Typically 110 feet. |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone. |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. |

**RECLAMATION**

| | |
|---|---|
| **SEEDBED PREPARATION:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 2-3 inches diameter.<br>**B.** Topsoil should be as firm as practicable prior to seeding.<br>**C.** The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately one-half inch. |

| CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: CRP<br>KEYSTONE XL | |
|---|---|
| **SEEDING METHOD, SEED MIX AND RATE:** | As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.<br>**B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.<br>**C.** Cover crop: To reduce erosion, an annual cover crop may be seeded per Keystone direction.<br>**D.** Approved Seed Mix: The seed mix for each CRP tract may vary depending on each CRP contract with the Farm Service Agency. The Contractor will seed the mix provided by, or specified by, Keystone at each CRP tract. |
| **NRCS RECOMMENDED SEEDING DATES:** | August 1 to June 15, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval. |
| **MULCHING AND MATTING:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting and Detail 47 for straw mulch.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **SLOPE AND TRENCH BREAKERS:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 3 for slope breakers and Detail 7 for trench breakers.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |

**ADDITIONAL PRACTICES**

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction.
4. Monitor and control noxious weeds as specified in the state Noxious Weed Management Plans.

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: FOR
## KEYSTONE XL W/W >/E WZK: d

| | | |
|---|---|---|
| **UNIT NAME:** | **FOREST** |  |
| **UNIT CODE:** | **FOR** | |
| **UNIT DESCRIPTION:** | Forest areas are dominated by native and introduced trees. Typical species include green ash, boxelder, plains cottonwood, elm, oak, mulberry, and eastern red cedar. | |
| **UNIT LOCATION:** | In northern areas this unit is primarily located on floodplains, in deep draws, and on steeper slopes. In southern areas of the project the unit may also occur on flat topography and along roads and fencelines. | |
| **UNIT GOALS:** | • Prevent damage to vegetation adjacent to the ROW when removing trees. • Restore native grass understory. • Stabilize slopes to prevent erosion. • Adequately decompact soil. • Complete all work to standards specified in the CMR Plan, contract documents and details, applicable permits, and Keystone's satisfaction. | |
| **SPECIAL CONSIDERATIONS:** | **1.** Dispose of excess wood debris as specified in the CMR Plan or as agreed to with local landowners per Keystone direction. | |
| | **CONSTRUCTION** | |
| **ROW WIDTH:** | Typically 110 feet in Montana and Nebraska. 85 feet in South Dakota. | |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage timber if directed by landowner.<br>**B.** Fell and clear trees in a manner that avoids injuring adjacent trees.<br>**C.** Tree stumps shall be removed for 5 feet either side of the trench line, where necessary for safe and level construction, and to allow feathering out spoil.<br>**D.** Where necessary on living trees with overhanging branches, cut broken branches at the fork; preserve the branch collar on the standing tree.<br>**E.** Dispose of woody debris according to landowner direction as approved by Keystone; otherwise chip and incorporate with subsoil (amount not to inhibit revegetation) or remove to designated site approved by Keystone. | |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone. | |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. | |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. | |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. | |
| | **RECLAMATION** | |
| **SEEDBED PREPARATION:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 2-3 inches diameter.<br>**B.** Topsoil should be as firm as practicable prior to seeding. | |

| CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: FOR<br>KEYSTONE XL W/W >/E WZK: d | |
|---|---|
| **SEEDING METHOD, SEED MIX AND RATE:** | As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Forested areas will be seeded with the native grass species that occur in forest openings and understories unless otherwise requested by the landowner. The appropriate seed mix for each FOR Con/Rec Unit is shown in the Revegetation Band on the Alignment Sheets.<br>**B.** The FOR Con/Rec Unit will be drill seeded unless slopes are too steep or soils are too rocky to safely operate seeding equipment, in which case, broadcast seeding will be conducted. Broadcast seed will be applied at twice the drill seed PLS/acre rate.<br>**C.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.<br>**D.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.<br>**E.** Cover crop: To reduce erosion, an annual cover crop may be seeded per Keystone direction. |
| **NRCS RECOMMENDED SEEDING DATES:** | As appropriate for the specified mix, for example, if seeding the TG seed mix utilize the TG seeding dates. |
| **MULCHING AND MATTING:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for straw mulch, and Detail 64 for wood mulch. |
| **SLOPE AND TRENCH BREAKERS:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 3 for slope breakers and Detail 7 for trench breakers.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |

**MANAGEMENT PRACTICES**

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction.
4. Monitor and control noxious weeds as specified in state Noxious Weed Management Plans.

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: IPH**
**KEYSTONE XL**

| | | |
|---|---|---|
| **UNIT NAME:** | **IMPROVED PASTURE AND HAYLAND** |  |
| **UNIT CODE:** | **IPH** | |
| **UNIT DESCRIPTION:** | Improved pastures and haylands are managed grasslands that have typically been planted with grasses for livestock forage or hay production. Improved pastures and haylands are often dominated by crested wheatgrass, smooth brome and legumes in various combinations, or seeded native tall grasses, depending on Project location. | |
| **UNIT LOCATION:** | Improved pastures and haylands occur on all spreads throughout the Keystone XL Project area. | |
| **UNIT GOALS:** | • Re-establish vegetation and prevent accelerated erosion. • Maintain livestock grazing and hayland production. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone's satisfaction. | |
| **SPECIAL CONSIDERATIONS:** | None unless otherwise directed by Keystone. | |
| **CONSTRUCTION** | | |
| **ROW WIDTH:** | Typically 110 feet. | |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. | |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone. | |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. | |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. | |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. | |
| **RECLAMATION** | | |
| **SEEDBED PREPARATION:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 2-3 inches diameter.<br>**B.** Topsoil should be as firm as practicable prior to seeding.<br>**C.** The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately one-half inch. | |

**SEEDING METHOD, SEED MIX AND RATE:**

As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.

ADDITIONAL REQUIREMENTS:

**A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.

**B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.

**C.** Cover crop: To reduce erosion, an annual cover crop may be seeded per Keystone direction.

**D.** The seed mix will vary depending on the pasture's location. The appropriate seed mix will be seeded at locations shown on the Alignment Sheets, unless otherwise directed by the landowner, or as directed by Keystone. Four seed mixes will typically be drill-seeded as shown below:

**Improved Pasture and Hayland Seed Mixture**
**Brome (BR)**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Bromus inermis* | Smooth brome | AC Rocket, AC Knowles hybrid, Carlton, Signal, Magna, Manchar, Badger, Radisson, Rebound, Barton, Baylor, Saratoga, Lincoln, Cottonwood, Bravo, Jubilee, Polar, Elsberry | 8.00 | - | 24 |
| | | **TOTAL** | **8.00** | **-** | **24** |

[1]Based on a drill seeding rate of 24 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]Other species such as crested wheatgrass, alfalfa, yellow sweetclover, or clover may be present in the field adjacent to the ROW and are expected to spread to the ROW in a relatively short period.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**Improved Pasture and Hayland Seed Mixture**
**Crested Wheatgrass (CW)**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron cristatum* | Crested wheatgrass | Fairway (Ephraim, Ruff, Parkway, NU-ARS-AC2, RoadCrest, Douglas) Hybrid (HyCrest, HyCrest II) | 8.00 | - | 32 |
| | | **TOTAL** | **8.00** | **-** | **32** |

[1]Based on a drill seeding rate of 32 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]Other species such as smooth brome, alfalfa, or sweetclover may be present in the field adjacent to the ROW and are expected to spread to the ROW in a relatively short period.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**Improved Pasture and Hayland Seed Mixture**
**Introduced Pasture (IP)**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | DRILL SEEDING RATE[1] PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron cristatum* | Crested wheatgrass | Fairway (Ephraim, Ruff, Parkway, NU-ARS-AC2, RoadCrest, Douglas) Hybrid (HyCrest, HyCrest II) | 2.00 | - | 6 |
| *Agropyron intermedium* | Intermediate wheatgrass | Manifest, Haymaker, Beefmaker, Reliant, Clarke, Slate, Chief, Oahe, Rush, Amur, Greendar, Tegmar | 2.00 | - | 4 |
| *Bromus inermis* | Smooth brome | AC Rocket, AC Knowles hybrid, Carlton, Signal, Magna, Manchar, Badger, Radisson, Rebound, Barton, Baylor, Saratoga, Lincoln, Cottonwood, Bravo, Jubilee, Polar, Elsberry | 2.00 | - | 6 |
| *Dactylis glomerata* | Orchardgrass | Chinook, Kay, Potomac, Baridana, Barula | 0.25 | - | 4 |
| *Medicago sativa*[3] | Alfalfa | Many varieties | 1.00 | - | 5 |
| *Melilotus officinalis* | Yellow sweetclover | Many varieties | 0.25 | - | 2 |
| | | **TOTAL** | **7.50** | - | **27** |

[1]Based on a drill seeding rate of 27 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]This may not be a complete list; other named varieties listed by USDA-NRCS in Montana and South Dakota are acceptable.
[3]Alfalfa must be planted by mid-August to ensure survival, otherwise, delete from mix.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**Improved Pasture and Hayland Seed Mixture**
**Tall Grassland Seed Mixture (TG)**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | DRILL SEEDING RATE[1] PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron smithii* | Western wheatgrass | Rodan, Walsh, Flintlock, Rosana | 4.00 | - | 8 |
| *Andropogon gerardii* | Big bluestem | Sunnyview, Bison, Bonilla, Champ, Rountree, Bonanza | 3.00 | - | 9 |
| *Bouteloua curtipendula* | Sideoats grama | Pierre, Butte | 3.00 | - | 14 |
| *Lolium perenne* | Perennial ryegrass | Linn | 5.00 | - | 26 |
| *Panicum virgatum* | Switchgrass | Forestburg, Nebraska 28, Pathfinder, Summer, Trailblazer | 0.75 | - | 7 |
| *Schizachyrium scoparium* | Little bluestem | Camper, Blaze, Pastura | 2.00 | | 12 |
| *Sorghastrum nutans* | Indiangrass | Chief, Tomahawk, Holt, Nebraska 54 | 3.00 | - | 12 |
| | | **TOTAL** | **20.75** | - | **88** |

[1]Based on a drill seeding rate of 88 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]This may not be a complete list; other named varieties listed by USDA-NRCS in South Dakota and Nebraska are acceptable.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

| | |
|---|---|
| **NRCS RECOMMENDED SEEDING DATES:** | August 1 to June 15, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval. |
| **MULCHING AND MATTING:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting and Detail 47 for straw mulch. <br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **SLOPE AND TRENCH BREAKERS:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 3 for slope breakers and Detail 7 for trench breakers. <br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |

**MANAGEMENT PRACTICES**

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction.
4. Monitor and control noxious weeds as specified in the state Noxious Weed Management Plans.

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: MG
## KEYSTONE XL

| | |
|---|---|
| **UNIT NAME:** | **MIXED GRASSLANDS** |
| **UNIT CODE:** | **MG** |
| **UNIT DESCRIPTION:** | Mixed grasslands are dominated by native perennial grasses such as western wheatgrass, needle-and-thread, blue grama, Sandberg bluegrass, prairie junegrass, little bluestem, prairie sandreed, green needlegrass and bluebunch wheatgrass. |
| **UNIT LOCATION:** | Mixed grasslands are the most extensive native vegetation type on the Keystone XL Project and occur primarily south of the Missouri River in Montana and throughout South Dakota. |
| **UNIT GOALS:** | • Re-establish native vegetation and prevent accelerated erosion. • Maintain wildlife habitat and livestock grazing production. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone's satisfaction. |
| **SPECIAL CONSIDERATIONS:** | None unless otherwise directed by Keystone. |
| | **CONSTRUCTION** |
| **ROW WIDTH:** | Typically 110 feet. |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone. |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. |
| | **RECLAMATION** |
| **SEEDBED PREPARATION:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 2-3 inches diameter.<br>**B.** Topsoil should be as firm as practicable prior to seeding.<br>**C.** The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately one-half inch. |

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: MG
## KEYSTONE XL

**SEEDING METHOD, SEED MIX AND RATE:**

As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.

ADDITIONAL REQUIREMENTS:

- **A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.
- **B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.
- **C.** The MG seed mix will be applied at locations shown on the Alignment Sheets , unless otherwise directed by the landowner, or as directed by Keystone. The MG seed mix will be drill seeded unless slopes are too steep or soils are too rocky to safely operate seeding equipment, in which case, broadcast seeding will be conducted.
- **D.** Cover crop: To reduce erosion, an annual cover crop may be seeded per Keystone direction.

**Mixed Grassland Seed Mixture MG-1**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | DRILL SEEDING RATE[1] PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron smithii* | Western wheatgrass | Rosana, Rodan | 3.00 | - | 8 |
| *Agropyron spicatum* | Bluebunch wheatgrass | Goldar | 1.50 | - | 5 |
| *Agropyron trachycaulum* | Slender wheatgrass | Pryor | 1.00 | - | 3 |
| *Bouteloua gracilis* | Blue grama | Bad River | 0.30 | - | 6 |
| *Calamovilfa longifolia* | Prairie sandreed | Goshen, Bowman | 0.75 | - | 5 |
| *Koeleria cristata* | Prairie junegrass | VNS | 0.10 | - | 5 |
| *Poa sandbergii* | Sandberg bluegrass | VNS, High Plains | 0.25 | - | 5 |
| *Schizachyrium scoparium* | Little bluestem | Badlands, Itasca | 0.50 | - | 3 |
| *Stipa comata* | Needle-and-thread | VNS | 2.00 | - | 5 |
| | | **TOTAL** | **9.4** | - | **45** |

VNS: Variety not specified
[1]Based on a drill seeding rate of 45 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]This may not be a complete list; other named varieties listed by USDA-NRCS in Montana are acceptable.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**Mixed Grassland Seed Mixture MG-2**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | DRILL SEEDING RATE[1] PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron smithii*[3] | Western wheatgrass | Rosana, Rodan, Walsh | 2.50 | - | 6 |
| *Agropyron trachycaulum* | Slender wheatgrass | Pryor | 1.00 | - | 3 |
| *Bouteloua gracilis* | Blue grama | Bad River | 0.30 | | 6 |
| *Buchloe dactyloides* | Buffalograss | Tatanka, Bismarck ecotype | 3.00 | - | 4 |
| *Calamovilfa longifolia* | Prairie sandreed | Goshen, Pronghorn | 0.50 | - | 3 |
| *Distichlis spicata* | Inland saltgrass | VNS | 0.25 | - | 3 |
| *Koeleria cristata* | Prairie junegrass | VNS | 0.10 | - | 5 |
| *Poa sandbergii* | Sandberg bluegrass | VNS, High Plains | 0.20 | - | 4 |
| *Schizachyrium scoparium* | Little bluestem | Badlands, Itasca | 0.50 | - | 3 |
| *Stipa comata* | Needle-and-thread | VNS | 2.00 | - | 5 |
| *Stipa viridula* | Green needlegrass | Lodorm, AC Mallard Ecovar | 0.75 | - | 3 |
| | | **TOTAL** | **11.10** | - | **45** |

VNS: Variety not specified
[1]Based on a drill seeding rate of 45 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]This may not be a complete list; other named varieties listed by USDA-NRCS in Montana and South Dakota are acceptable.
[3]If western wheatgrass is unavailable, thickspike wheatgrass (*Agropyron dasystachyum* var. Critana, Bannock, or Elbee) may be substituted at a rate of 2.0 PLS pounds per acre.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

# CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: MG
# KEYSTONE XL

**Mixed Grassland Seed Mixture MG-3**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron smithii*[3] | Western wheatgrass | Rosana, Rodan, Walsh | 3.00 | - | 7 |
| *Agropyron trachycaulum* | Slender wheatgrass | Pryor | 1.00 | - | 3 |
| *Andropogon gerardii* | Big bluestem | Sunnyview, Bison, Bonilla, Bonanza | 1.50 | - | 4 |
| *Bouteloua curtipendula* | Sideoats grama | Butte, Pierre, Trailway | 1.25 | - | 6 |
| *Bouteloua gracilis* | Blue grama | Bad River | 0.20 | - | 4 |
| *Calamovilfa longifolia* | Prairie sandreed | Goshen, Pronghorn | 1.00 | - | 6 |
| *Koeleria cristata* | Prairie junegrass | VNS | 0.10 | - | 5 |
| *Schizachyrium scoparium* | Little bluestem | Blaze, CamperBadlands, Itasca | 1.00 | - | 6 |
| *Stipa viridula* | Green needlegrass | Lodorm, AC Malard Ecovar | 1.00 | - | 4 |
| | | **TOTAL** | **10.05** | - | **45** |

VNS: Variety not specified
[1]Based on a drill seeding rate of 45 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
[2]This may not be a complete list; other named varieties listed by USDA-NRCS in South Dakota and Nebraska are acceptable.
[3]If western wheatgrass is unavailable, thickspike wheatgrass (*Agropyron dasystachyum* var. Critana, Bannock, or Elbee) may be substituted at a rate of 2.0 PLS pounds per acre.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

| | |
|---|---|
| **NRCS RECOMMENDED SEEDING DATES:** | August 1 to June 15, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval. |
| **MULCHING AND MATTING:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for straw mulch, and Detail 64 for wood mulch. ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **SLOPE AND TRENCH BREAKERS:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 3 for slope breakers and Detail 7 for trench breakers. ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |

**MANAGEMENT PRACTICES**

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction.
4. Monitor and control noxious weeds as specified in the Montana and South Dakota Noxious Weed Management Plans.

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: RIP
## KEYSTONE XL

| | | |
|---|---|---|
| **UNIT NAME:** | **RIPARIAN** |  |
| **UNIT CODE:** | **RIP** | |
| **UNIT DESCRIPTION:** | Riparian woodlands include forested and shrub dominated areas around streams and rivers. Common trees and shrubs include plains cottonwood, green ash, box elder, Russian olive, sandbar willow, Wood's rose, snowberry, and silver sagebrush. Herbaceous understories are often dominated by Kentucky bluegrass, western wheatgrass, and redtop. | |
| **UNIT LOCATION:** | Primarily located on floodplains and terraces along streams and rivers. This Con/Rec Unit is relatively limited on the Keystone XL Project. | |

| | |
|---|---|
| **UNIT GOALS:** | • Prevent damage to vegetation adjacent to the ROW when removing trees. • Restore native grass understory. • Stabilize slopes to prevent erosion. • Adequately decompact soil. • Complete all work to standards specified in the CMR Plan, contract documents and details, applicable permits, and Keystone's satisfaction. |
| **SPECIAL CONSIDERATIONS:** | **1.** Note that this type may be adjacent to or associated with wetlands and stream crossings.<br>**2.** Implement wetland and stream crossing procedures as shown on Alignment Sheets or directed by Keystone.<br>**3.** Wetland or stream crossing procedures will take precedent over this Con/Rec Unit should discrepancies occur. |

**CONSTRUCTION**

| | |
|---|---|
| **ROW WIDTH:** | Typically 110 feet. |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage timber if directed by landowner.<br>**B.** Fell and clear trees to avoid injuring adjacent trees.<br>**C.** Tree stumps shall be removed for 5 feet either side of the trench line and where necessary for safe and level construction.<br>**D.** Where necessary on living trees with overhanging branches, cut broken branches at the fork; preserve the branch collar on the standing tree.<br>**E.** Dispose of woody debris according to landowner direction as approved by Keystone; otherwise chip and incorporate with subsoil (amount not to inhibit revegetation) or remove to designated site approved by Keystone.<br>**F.** Mow shrubby vegetation to ground level and leave rootstock intact unless grading is necessary. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone. |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW.<br>ADDITIONAL REQUIREMENTS:<br>A. Insure adequate erosion control is in place during construction to prevent sediment from reaching any associated streams or rivers. |

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: RIP
## KEYSTONE XL

### RECLAMATION

**SEEDBED PREPARATION:**

As specified in the CMR Plan.

ADDITIONAL REQUIREMENTS:

**A.** Dirt clods should typically be smaller than 2-3 inches diameter.

**B.** Topsoil should be as firm as practicable prior to seeding.

**SEEDING METHOD, SEED MIX AND RATE:**

As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.

ADDITIONAL REQUIREMENTS:

**A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.

**B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.

**C.** The RIP seed mix will be applied at locations shown on the Alignment Sheets or as directed by Keystone. The RIP seed mix will be drill seeded unless slopes are too steep or soils are too rocky to safely operate seeding equipment, in which case, broadcast seeding will be conducted.

**D.** Cover crop: To reduce erosion, an annual cover crop may be seeded per Keystone direction.

**Riparian Seed Mixture (RIP)**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | DRILL SEEDING RATE[1] PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron smithii* | Western wheatgrass | Rosanna, Rodan, Walsh | 5.00 | - | 13 |
| *Agropyron trachycaulum* | Slender wheatgrass | Pryor | 1.00 | - | 3 |
| *Bouteloua gracilis* | Blue grama | Bad River | 0.20 | | 4 |
| *Elymus canadensis* | Canada wildrye | VNS | 3.00 | - | 8 |
| *Stipa viridula* | Green needlegrass | Lodorm | 2.50 | - | 10 |
| | | **TOTAL** | **11.70** | - | **38** |

VNS: Variety not specified

[1]Based on a drill seeding rate of 38 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.

[2]This may not be a complete list; other named varieties listed by USDA-NRCS in Montana and South Dakota are acceptable.

[3]In Spreads 4-6, big bluestem and switchgrass will be added to the mix at the rates shown below:

Panicum virgatum-Switchgrass, (Varieties Forestburg, Nebraksa 28, Pathfinder, Summer, Trailblazer), at 2.00 pounds PLS/acre

Andropogon gerardii-Big bluestem, (Varieties Sunnyview, Bison, Bonilla, Champ, Rountree, Bonanza), at 3.00 pounds PLS/acre

NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**NRCS RECOMMENDED SEEDING DATES:**

August 1 to June 15, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval.

**MULCHING AND MATTING:**

As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for straw mulch, and Detail 64 for wood mulch.

ADDITIONAL REQUIREMENTS:

**A.** Respread wood debris may negate the need for straw mulch per Keystone direction.

**SLOPE AND TRENCH BREAKERS:**

As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 3 for slope breakers and Detail 7 for trench breakers.

ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone.

### MANAGEMENT PRACTICES

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction. Monitor and control noxious weeds per the Noxious Weed Plan.

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SB

| | |
|---|---|
| **UNIT NAME:** | **SHELTERBELT** |
| **UNIT CODE:** | **SB** |
| **UNIT DESCRIPTION:** | Planted tree and shrub shelterbelts and windbreaks. Common northern species are: plains cottonwood, Chinese elm, American elm, Austrian pine, Siberian peashrub, and lilac. Common southern species are: Osage orange, eastern red cedar, locust, and hawthorne. |
| **UNIT LOCATION:** | Typically located at field margins, near roadsides, or around residences. Refer to Alignment Sheets and/or Keystone field verification for specific locations. |
| **RECLAMATION GOALS:** | • Prevent damage to vegetation adjacent to the ROW when removing trees. • Restore grass understory. • Provide non-vegetated windbreaks. • Adequately decompact soil. • Complete all work to standards specified by CMR Plan, contract documents and details, applicable permits, and Keystone's satisfaction. |

### CONSTRUCTION

| | |
|---|---|
| **ROW WIDTH:** | 110 feet unless otherwise directed by Alignment Sheets and/or Keystone. |
| **CLEARING:** | **1.** Salvage timber if directed by landowner.<br>**2.** Fell and clear trees to avoid injuring adjacent trees.<br>**3.** Tree stumps shall be removed for 5 feet either side of the trench line and where necessary for safe and level construction.<br>**4.** Where necessary on living trees with overhanging branches, cut broken branches at the fork; preserve the branch collar on the standing tree.<br>**5.** Dispose of woody debris according to landowner direction; otherwise chip and incorporate with subsoil (amount not to inhibit revegetation) or remove to designated site approved by Keystone. Do not bury debris in trench. |
| **TOPSOIL SALVAGE:** | **1.** Salvage topsoil only over the trench unless additional grading is necessary to facilitate construction, then salvage topsoil from entire area to be graded.<br>**2.** Salvage entire topsoil horizon, or up to 12 inches, whichever is less, unless otherwise directed by Keystone. |
| **TOPSOIL and SPOIL PLACEMENT:** | **1.** Store topsoil and spoil in windrows along edge of ROW or in other configurations convenient to the work per Keystone direction.<br>**2.** Maintain separation between topsoil and spoil piles.<br>**3.** Maintain gaps in topsoil and spoil windrows to prevent stormwater ponding. |
| **TRENCHING:** | **1.** Trench according to CMR Plan, SWPPP, and contract documents.<br>**2.** Dewater trench as necessary according to CMR Plan, SWPPP, and Keystone direction to minimize damage to adjacent lands, waterways, or crops. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | **1.** Backfill, decompact and regrade per Con/Rec Detail B,D&R. |
| **TEMPORARY EROSION CONTROL:** | As directed by CMR Plan, SWPPP, and/or Keystone:<br>**1.** Stabilize topsoil and spoil piles with water or biodegradable tackifier as necessary to prevent wind erosion.<br>**2.** Install other erosion control as necessary to prevent erosion within the ROW, and off-ROW impacts.<br>**3.** Maintain and/or reinstall erosion control features to ensure proper function at all times. |

### RECLAMATION

| | |
|---|---|
| **SEEDBED PREPARATION:** | **1.** Disc or harrow the regraded ROW to produce a consistent seedbed with clods typically less than 4 inches in diameter.<br>**2.** Prepare a seedbed that is free of competing vegetation and not subject to excessive erosion. A firm seedbed will ensure that seed is placed at the proper depth. |

| CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SB | |
|---|---|
| **SEEDING METHOD, SEED MIX AND RATE:** | As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.<br>**B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.<br>**C.** Areas within the SB type will be seeded as shown on the alignment sheets, unless otherwise directed by the landowner, or as directed by Keystone.<br>**D.** Cover crop: To reduce erosion, an annual cover crop may be seeded per Keystone direction. |
| **NRCS RECOMMENDED SEEDING DATES:** | August 1 to June 15, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval. |
| **PLANTING:** | Replace trees as directed by Keystone. |
| **PERMANENT EROSION CONTROL:** | Install permanent slope and trench breakers, mulching, and matting as directed by CMR Plan, SWPPP, and Keystone. |

**ADDITIONAL PRACTICES**

1. Install windfence across the ROW in areas where trees and/or shrubs have been removed as directed by Keystone.
2. Avoid mixing topsoil and subsoil through rutting per the CMR Plan.
3. Construction and reclamation practices may be modified per Keystone.

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SP**
**KEYSTONE XL**

| | |
|---|---|
| **UNIT NAME:** | **SANDY PRAIRIE** |
| **UNIT CODE:** | **SP** |
| **UNIT DESCRIPTION:** | Native prairie on sandy soils dominated primarily by warm- season grasses such as little bluestem, sand bluestem, prairie sandreed, and switchgrass. Topography is typically flat to gently rolling. |
| **UNIT LOCATION:** | The Sandy Prairie unit occurs in southern South Dakota and northern Nebraska. The unit is interspersed with hay meadows and crop land. |
| **UNIT GOALS:** | • Maintain soil structure and stability. • Restore native grass species. • Maintain wildlife habitat and livestock grazing production. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone's satisfaction. |
| **SPECIAL CONSIDERATIONS:** | **1.** Incorporate supplementary construction and reclamation procedures that may be provided by Keystone.<br>**2.** Stabilize topsoil salvage piles with bio-degradable tackifier.<br>**3.** Apply straw or native hay mulch for erosion control after clean-up as directed by Keystone.<br>**4.** Install erosion control matting after regrading as specified by Keystone. Install erosion control matting over native hay mulch as specified by Keystone. In some areas, tackifier may be used in place of matting if approved by Keystone.<br>**5.** Do not decompact the ROW unless specifically directed by Keystone.<br>**6.** Seed mix will be applied in two procedures with a drill <u>and</u> broadcast seeder in some locations as described under Seeding Method, Seed Mix and Rate. |

**CONSTRUCTION**

| | |
|---|---|
| **ROW WIDTH:** | Typically 110 feet. |
| **CLEARING:** | As specified in the CMR Plan.<br><u>ADDITIONAL REQUIREMENTS</u>:<br>**1.** Leave root crowns and root structures in place to the maximum extent practicable. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br><u>ADDITIONAL REQUIREMENTS</u>:<br>**A.** Utilize trench and working salvage (Detail 54) on slopes less than 5% where shown on Alignment Sheets or as directed by Keystone.<br>**B.** Where grading is necessary, salvage topsoil from entire area to be graded (Detail 53).<br>**C.** Salvage topsoil horizon at depths as shown on Alignment Sheets or as directed by Keystone.<br>**D.** Stabilize topsoil salvage piles with bio-degradable tackifier as directed by Keystone. |
| **TRENCHING:** | As specified in the CMR Plan.<br><u>ADDITIONAL REQUIREMENTS</u>:<br>**A.** Anticipate trenchwall instability.<br>**B.** Insure that topsoil (salvaged or unsalvaged) is not lost to trench caving. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench and match adjacent topography.<br><u>ADDITIONAL REQUIREMENTS</u>:<br>**A.** Do not decompact the ROW (subsoil or topsoil) unless specifically directed by Keystone.<br>**B.** Avoid scalping of undisturbed topsoil on the ROW when backfilling spoil and redistributing stockpiled topsoil. |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW.<br><u>ADDITIONAL REQUIREMENTS</u>:<br>**A.** Stabilize topsoil salvage piles with biodegradable tackifier as directed by Keystone.<br>**B.** Install other erosion control to prevent erosion within the ROW, and off-ROW impacts as directed by Keystone.<br>**C.** Maintain and/or reinstall erosion control features to ensure proper function at all times. |

# CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SP
# KEYSTONE XL

## RECLAMATION

**SEEDBED PREPARATION:**

As specified in the CMR Plan.

ADDITIONAL REQUIREMENTS:

**A.** Additional seedbed preparation may be necessary within this Con/Rec Unit at Keystone direction.
**B.** Cultipack or roll ROW to firm topsoil prior to reseeding as authorized by Keystone.
**C.** Composted manure may be used where and as directed by Keystone. Fresh manure is not acceptable.

**SEEDING METHOD, SEED MIX AND RATE:**

As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.

ADDITIONAL REQUIREMENTS:

**A.** Where topography allows drill seeding, seed will be applied in two applications. The first application will be completed with an approved drill seeder using half the seed mix shown below; the second application will be completed with an approved broadcast seeder using the remaining half. Where topography is too steep or loose to operate a drill seeder, the entire seed mix will be applied using an approved broadcast seeder.
**B.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed in a dry, secure location.
**C.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.
**D.** The SH seed mix will be applied at locations shown on the Alignment Sheets or as directed by Keystone.
**E.** Use a chain to cover broad-cast seeded areas. Do not use a harrow to cover broadcast-seeded areas in the Sandy Prairies unless directed by Keystone. Use of a harrow may bury seed too deeply.
**F.** Cover crop: To aid in managing wind and water erosion potential, an annual cover crop (perennial ryegrass (var. Linn), a Keystone-approved annual grass/crop, or QuickGuard) may be seeded per Keystone direction.

**Sandy Prairie (SP) Seed Mixture**

| SCIENTIFIC NAME | COMMON NAME | BROADCAST SEEDING RATE[1] Pounds PLS/ Acre | BROADCAST SEEDING RATE[1] PLS/ sq.ft. | Percent in Mix | NRCS Allowable Percentage Range | Listed Varieties by Preference |
|---|---|---|---|---|---|---|
| **GRASSES:** | | | | | | |
| *Agropyron smithii* | Western wheatgrass | 1.25 | 3 | 2.4% | 0 – 5 | 1. Rodan; 2. Rosana; 3. Barton |
| *Andropogon hallii* | Sand bluestem | 12.00 | 31 | 24.4% | 20 – 40 | 1. Goldstrike; 2. Garden County; 3. Champ |
| *Bouteloua gracilis* | Blue grama | 0.25 | 5 | 3.9% | 0 – 10 | 1. Bad River |
| *Calamovilfa longifolia* | Prairie sandreed | 3.25 | 20 | 15.7% | 15 – 25 | 1. Goshen; 2. Pronghorn |
| *Elymus Canadensis* | Canada wildrye | 1.25 | 3 | 2.4% | 0 – 5 | 1. Mandan |
| *Eragrosts trichodes* | Sand lovegrass | 0.50 | 15 | 11.8% | 5 – 15 | 1. Nebraska 27 |
| *Panicum virgatum* | Switchgrass | 1.50 | 13 | 10.2% | 5 – 15 | 1. Nebraska 28; 2. Pathfinder |
| *Schizachyrium scoparium* | Little bluestem | 4.50 | 27 | 21.3% | 15 – 25 | 1. Camper; 2. Pastura; 3. Blaze |
| *Sorghastrum nutans* | Indiangrass | 2.50 | 10 | 7.9% | 5 – 15 | 1. Holt; 2. Nebraska 54 |
| | **TOTAL** | **27.00** | **127** | **100** | | |

[1]Based on a broadcast seeding rate of approximately 127 Pure Live Seed (PLS) per square foot; total PLS/sq ft does not include perennial ryegrass which is used as a companion crop. Seed rates will be halved where drill seeding is used.

| CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SP<br>KEYSTONE XL | |
|---|---|
| **NRCS RECOMMENDED SEEDING DATES:** | November 1 to June 30, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval. |
| **MULCHING AND MATTING:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for weed free native hay or straw mulch. Cornstalks may be used for mulch with Keystone approval.<br>ADDITIONAL REQUIREMENTS:<br>**A.** All portions of the Project within this Con/Rec Unit will receive a companion crop specified by the NRCS and Keystone, and either straw mulch, cornstalk mulch, and/or erosion control matting at locations shown on Alignment Sheets or as directed by Keystone.<br>**B.** Erosion control matting may be applied over native hay or straw mulch as directed by Keystone.<br>**C.** Biodegradable pins approved by Keystone will be used in place of metal staples to anchor erosion control matting within this Con/Rec Unit. |
| **SLOPE AND TRENCH BREAKERS:** | Slope breakers are not anticipated in this Con/Rec Unit unless specifically directed by Keystone since most erosion is caused by wind rather than water. Trench breakers will be installed where directed by Keystone. |
| **MANAGEMENT PRACTICES** | |
| **1.** Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan**.**<br>**2.** Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.<br>**3.** Monitor revegetation and soil stability post construction. Areas of failed reclamation will be repaired.<br>**4.** Monitor and control noxious weeds as specified in the Nebraska and South Dakota Noxious Weed Management Plans. | |

# CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: TG
# KEYSTONE XL

| | | |
|---|---|---|
| **UNIT NAME:** | **TALL GRASSLANDS** |  |
| **UNIT CODE:** | **TG** | |
| **UNIT DESCRIPTION:** | Tall grasslands are dominated by tall warm-season grass species including big bluestem, switchgrass, Indiangrass, and little bluestem, and shorter warm-season grasses such as blue grama and sideoats grama. | |
| **UNIT LOCATION:** | Tall grasslands occur in southern South Dakota and throughout Nebraska in areas that are not farmed or a part of the Sandy Prairies. Many of the grass species within the Con/Rec Unit are the same as those occurring within the Sandy Prairies and Sub-irrigated Meadow Con/Rec Units, but topography, soil type, and hydrology differ between those types and this unit. | |

| | |
|---|---|
| **UNIT GOALS:** | • Re-establish native vegetation and prevent accelerated erosion. • Maintain wildlife habitat and livestock grazing production. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone's satisfaction. |
| **SPECIAL CONSIDERATIONS:** | None unless otherwise directed by Keystone. |

**CONSTRUCTION**

| | |
|---|---|
| **ROW WIDTH:** | Typically 110 feet. |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil horizon at depths shown on Alignment Sheets or as directed by Keystone. |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench, relieve compaction, and match adjacent topography.<br>ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone. |
| **TEMPORARY EROSION CONTROL:** | As specified in the CMR Plan and authorized by Keystone to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. |

**RECLAMATION**

| | |
|---|---|
| **SEEDBED PREPARATION:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 2-3 inches diameter.<br>**B.** Topsoil should be as firm as practicable prior to seeding.<br>**C.** The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately one-half inch. |

# CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: TG
# KEYSTONE XL

**SEEDING METHOD, SEED MIX AND RATE:**

As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment.

ADDITIONAL REQUIREMENTS:

**A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed a dry, secure location.

**B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.

**C.** The TG seed mix will be applied at locations shown on the Alignment Sheets, unless otherwise directed by the landowner, or as directed by Keystone. The TG seed mix will be drill seeded unless slopes are too steep or soils are too rocky to safely operate seeding equipment, in which case, broadcast seeding will be conducted.

**D.** Cover crop: If permanent seeding is delayed to the following growing season, perennial ryegrass (var. Linn) or another annual crop may be seeded per Keystone direction.

**Tall Grassland Seed Mixture (TG)**

| SCIENTIFIC NAME | COMMON NAME | VARIETY[2] | DRILL SEEDING RATE[1] Pounds PLS/ Acre | | PLS/ sq.ft. |
|---|---|---|---|---|---|
| **GRASSES:** | | | | | |
| *Agropyron smithii* | Western wheatgrass | Rodan, Walsh, Flintlock, Rosana | 4.00 | - | 10 |
| *Andropogon gerardii* | Big bluestem | Sunnyview, Bison, Bonilla, Champ, Rountree, Bonanza | 5.00 | - | 15 |
| *Bouteloua curtipendula* | Sideoats grama | Pierre, Butte | 3.00 | - | 14 |
| *Panicum virgatum* | Switchgrass | Forestburg, Nebraska 28, Pathfinder, Summer, Trailblazer | 0.75 | - | 7 |
| *Schizachyrium scoparium* | Little bluestem | Camper, Blaze, Pastura | 2.00 | - | 12 |
| *Sorghastrum nutans* | Indiangrass | Chief, Tomahawk, Holt, Nebraska 54 | 3.00 | - | 12 |
| | | **TOTAL** | **17.75** | - | **70** |

[1]Based on a drill seeding rate of 70 Pure Live Seed (PLS) per square foot excluding perennial ryegrass. Where broadcast seeding is used, the rate will be doubled.
[2]This may not be a complete list; other named varieties listed by USDA-NRCS in South Dakota and Nebraska are acceptable.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**NRCS RECOMMENDED SEEDING DATES:**

November 1 to June 30, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval.

**MULCHING AND MATTING:**

As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for straw mulch, and Detail 64 for wood mulch.

ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone.

**SLOPE AND TRENCH BREAKERS:**

As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 3 for slope breakers and Detail 7 for trench breakers.

ADDITIONAL REQUIREMENTS: None unless otherwise directed by Keystone.

## MANAGEMENT PRACTICES

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction.
4. Monitor and control noxious weeds as specified in the South Dakota and Nebraska Noxious Weed Management Plans.

## CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SBP
## KEYSTONE XL W/W >/E WZK: d

| | |
|---|---|
| **UNIT NAME:** | **SUBIRRIGATED PASTURE** |
| **UNIT CODE:** | **SBP** |
| **UNIT DESCRIPTION:** | The Subirrigated Pasture type includes subirrigated plains and hay meadows. Soils are typically fine sands, with narrow clay bands in some areas. Topography is typically flat. The water table within this Con/Rec Unit is often within six feet of the surface. Native grasses include big bluestem, switchgrass, and little bluestem; introduced grasses include timothy, orchardgrass, and Kentucky bluegrass . Wetlands may occur adjacent to, but not part of, this Con/Rec Unit. |
| **UNIT LOCATION:** | Subirrigated Pastures occur in southern South Dakota and portions of Nebraska, primarily in Tripp, Keya Paha, Rock, Holt, Antelope, and Nance counties. |
| **UNIT GOALS:** | • Maintain soil structure and stability to the greatest extent practicable. • Restore native grass species. • Maintain wildlife habitat and hay and livestock grazing production. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone's satisfaction. |
| **SPECIAL CONSIDERATIONS:** | **1.** Anticipate trench wall instability<br>**2.** Anticipate trench water management procedures to be employed throughout construction.<br>**3.** Do not decompact the ROW unless specifically directed by Keystone.<br>**4.** Backfilling, final cleanup, erosion control, and reseeding must be conducted progressively with the minimal time practicable between procedures.<br>**5.** The ROW will not be utilized for access or project traffic following final cleanup within this Con/Rec Unit. |
| **CONSTRUCTION** | |
| **ROW WIDTH:** | Typically 110 feet. Note that extra workspace has been identified in many areas within this Con/Rec unit to allow for spoil storage if a wide trench is required. Do not utilize the additional workspace unless necessary and directed by Keystone. |
| **CLEARING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Do not clear more than 110 feet of ROW unless directed by Keystone.<br>**B.** Leave root crowns and root structures in place to the maximum extent practicable.<br>**C.** Minimize clearing equipment on the ROW. |
| **TOPSOIL SALVAGE:** | As specified in the CMR Plan to maintain the topsoil resource and reclamation potential.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Salvage topsoil from the entire work area except under topsoil storage piles (Detail 53).<br>**B.** Stabilize topsoil salvage piles with bio-degradable tackifier as directed by Keystone and maintain until topsoil replacement.<br>**C.** Salvage topsoil horizon at depths as shown on Alignment Sheets or as directed by Keystone.<br>**D.** Additional topsoil salvage may be necessary outside of the 110 foot Right-of-way, if additional workspace is needed to accommodate a wide trench and additional spoil. |
| **TRENCHING:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Anticipate substantial trench instability.<br>**B.** Insure that topsoil (salvaged or unsalvaged) is not lost to trench caving.<br>**C.** Trench dewatering or other construction procedures, such as floating the pipe, that are suitable for use in saturated or flooded conditions may be necessary. The actual methods used to construct the trench, dewater the trench, and lay the pipe will be approved by Keystone. |

| CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SBP<br>KEYSTONE XL W/W >/E WZK: d | |
|---|---|
| **BACKFILL, DECOMPACTION AND REGRADING:** | As specified in the CMR Plan to avoid slumping over the trench and match adjacent topography.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Do not decompact the ROW (subsoil or topsoil) unless specifically directed by Keystone.<br>**B.** Avoid scalping undisturbed topsoil when redistributing stockpiled topsoil.<br>**C.** Backfilling, final cleanup, erosion control, and reseeding must be conducted progressively with the minimal time practicable between procedures. |
| **TEMPORARY and PERMANENT EROSION CONTROL:** | As specified in the CMR Plan to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Implement procedures to prevent anticipated sediment from saturated spoil and topsoil from flowing outside the ROW boundaries.<br>**B.** RoW stabilization measures must be carried out immediately following any topsoil replacement activities. This will consist of; straw mulch application across the entire RoW, installation of erosion control matting on slopes as specified by Keystone, use of NRCS recommended cover crops, and application of tackifiers or hydromulch in place of matting if approved by Keystone.<br>**C.** Maintain and/or reinstall erosion control features to ensure proper function at all times. |
| **RECLAMATION** | |
| **SEEDBED PREPARATION:** | As specified in the CMR Plan.<br>ADDITIONAL REQUIREMENTS:<br>**A.** Dirt clods should typically be smaller than 2-3 inches diameter.<br>**B.** Topsoil should be as firm as practicable prior to seeding.<br>**C.** The seedbed should be firm enough so that the boot heel of an average adult penetrates the soil to a depth of approximately one-half inch. |

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SBP**
**KEYSTONE XL W/W >/E WZK: d**

**SEEDING METHOD, SEED MIX AND RATE:**

As specified in the CMR Plan. See Detail 70 for descriptions of seeding procedures and approved equipment.

ADDITIONAL REQUIREMENTS:

Due to seasonal constraints relative to successful re-establishment seeding must be conducted prior to July 15th to allow for adequate length of growing season to avoid winter-kill. Any areas unable to be re-seeded by this date will need to be deferred until after Oct 1 to ensure seed germination does not occur until after frost conditions to avoid winter-kill.

**A.** Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed in a dry, secure location.

**B.** The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location.

**C.** A seed mix of native species will be used in areas designated MA on the Revegetation Band of the Alignment Sheets. The seed mix will be drill seeded unless slopes are too steep or soils are too rocky to safely operate seeding equipment, in which case, broadcast seeding will be conducted.

**D.** Cover crop: To aid in managing wind and water erosion potential, an annual cover crop (perennial ryegrass (var. Linn), a Keystone-approved annual grass/crop, QuickGuard), or Proso millet may be seeded to those areas planted prior to the October 1st date as per Keystone direction.

**Subirrigated Pasture (SBP) Seed Mixture**

| SCIENTIFIC NAME | COMMON NAME | DRILL SEEDING RATE[1] Pounds PLS/ Acre | PLS/ sq.ft. | Percent in Mix | NRCS Allowable Percentage Range | Listed Varieties by Preference |
|---|---|---|---|---|---|---|
| **GRASSES:** | | | | | | |
| *Agropyron smithii* | Western wheatgrass | 2.50 | 6 | 9.0% | 0 - 20 | 1. Rodan; 2. Rosana; 3. Barton |
| *Andropogon gerardii* | Big bluestem | 6.00 | 23 | 34.3% | 30 – 40 | 1. Pawnee; 2. Champ; 3. Bonanza |
| *Elymus Canadensis* | Canada wildrye | 1.25 | 3 | 4.4% | 0 – 5 | 1. Mandan |
| *Panicum virgatum* | Switchgrass | 1.00 | 9 | 13.4% | 5 – 20 | 1. Nebraska 28; 2. Pathfinder; 3. Forestburg |
| *Schizachyrium scoparium* | Little bluestem | 1.75 | 10 | 14.9% | 10 – 20 | 1. Camper; 2. Pastura; 3. Blaze |
| *Sorghastrum nutans* | Indiangrass | 4.00 | 16 | 23.9% | 15 – 30 | 1. Holt; 2. Nebraska 54 |
| | **TOTAL** | **16.50** | **67** | **100** | | |

[1]Based on a drill seeding rate of 67 Pure Live Seed (PLS) per square foot. Where broadcast seeding is used, the rate will be doubled.
NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.

**NRCS RECOMMENDED SEEDING DATES:**

October 1 to July 15, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval.

| CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SBP<br>KEYSTONE XL W/W >/E WZK: d | |
|---|---|
| **MULCHING AND MATTING:** | As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for weed free native hay or straw mulch. Cornstalks may be used for mulch with Keystone approval.<br>ADDITIONAL REQUIREMENTS:<br>**A.** All portions of the Project within this Con/Rec Unit will receive a companion crop for those areas seeded prior to July 15th. No companion crops will be applied with those areas seeded on or after Oct 1.<br>**B.** All portions of the project within this Con/Rec Unit will receive and either straw mulch, cornstalk mulch, and/or erosion control matting at locations shown on Alignment Sheets or as directed by Keystone.<br>**C.** RoW stabilization measures of all topsoils will consist of; straw mulch application across the entire RoW, installation of erosion control matting on slopes as specified by Keystone, and application of tackifiers or hydromulch may be used in place of matting if approved by Keystone.<br>**D.** Erosion control matting may be applied over native hay or straw mulch as directed by Keystone.<br>**E.** Biodegradable pins approved by Keystone will be used in place of metal staples to anchor erosion control matting within this Con/Rec Unit.<br>**F.** Areas where erosion control matting has been installed will be fenced to prevent livestock access as directed by Keystone. |
| **SLOPE AND TRENCH BREAKERS:** | Slope breakers are not required in this Con/Rec Unit unless specifically directed by Keystone. Trench breakers will be installed as directed by Keystone. |

**MANAGEMENT PRACTICES**

1. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan.
2. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval.
3. Monitor revegetation and soil stability post construction. Areas of failed reclamation will be repaired.
4. Monitor and control noxious weeds as specified in the Nebraska and South Dakota Noxious Weed Management Plans.

## RECLAMATION OF CONTRACTOR CAMPS, PIPE YARDS AND CONTRACTOR YARDS

| | |
|---|---|
| **UNIT NAME:** | **Contractor Camp, Contractor Yard and Pipe Yard Facilities** |
| **UNIT CODE:** | **YARD** |
| **UNIT DESCRIPTION:** | Contractor camps, contractor yards, pipe storage yards, staging areas, and other temporary facilities. |
| **UNIT LOCATION:** | Several yards and facilities are associated with each construction Spread. Refer to project maps for exact locations. |
| **UNIT GOALS:** | • Salvage and maintain topsoil.<br>• Prevent off-site erosion.<br>• De-compact subsoil prior to respreading topsoil.<br>• Re-establish grade to match adjacent contours.<br>• Remove all construction and facility debris and material.<br>• Re-establish site capacity and productivity unless otherwise specified.<br>• Complete all work to standards specified in the CMR Plan, contract documents and details, applicable permits, landowner easement agreements, and Keystone's satisfaction. |
| **CONSTRUCTION** | |
| **TOPSOIL SALVAGE:** | **1.** Prepare area per site specific drawings or as directed by Keystone.<br>**2.** Salvage topsoil. Salvage the entire topsoil horizon (A horizon), or up to 12 inches, whichever is less, unless otherwise directed by Keystone. Salvage herbaceous and small shrub vegetation with topsoil. Where frozen topsoil conditions are encountered, appropriate topsoil salvaging methods and proper equipment (i.e., frozen topsoil cutter or equivalent) must be used to ensure no topsoil/ subsoil mixing occurs, and the equivalent land capability is maintained.<br>**3.** If subsoil is stored, maintain an adequate gap between subsoil and topsoil to prevent mixing per Keystone direction. |
| **TOPSOIL PLACEMENT:** | **1.** Grade the site to direct water away from the Yard or Facility and towards silt fence which surrounds the perimeter of the Yard of Facility.<br>**2.** Store topsoil in windrows along the site perimeter, leaving gaps for drainage.<br>**3.** Maintain topsoil windrows to prevent stormwater ponding. |
| **TEMPORARY EROSION CONTROL:** | As detailed by the CMR Plan, SWPPP, and/or Keystone:<br>**1.** Stabilize topsoil piles with biodegradable tackifier as necessary to prevent wind erosion.<br>**2.** Install and silt fence around the perimeter of the Yard or Facility to prevent off-site sedimentation. Ensure adequate distance between the edge of topsoil piles and perimeter silt fence to allow for water ponding or soil sloughing.<br>**3.** Maintain and/or reinstall silt fence or other erosion control features to ensure proper function at all times.<br>**4.** Use and maintain appropriate materials (soil, gravel, etc.) for adequate access (entry/exit). Ensure that access point materials and/or sources have been approved by county or municipal authorities as necessary (e.g. weed-free gravel). |
| **RECLAMATION** | |
| **CLEANUP** | **1.** Remove all project-related construction debris and structures, including gravel, geo-textile, buildings, utilities, material, and trash from the Yard or Facility unless otherwise agreed to by the landowner and Keystone. |

| RECLAMATION OF CONTRACTOR CAMPS, PIPE YARDS AND CONTRACTOR YARDS | |
|---|---|
| **DECOMPACTION AND REGRADING:** | **1.** Decompact subsoil prior to replacing topsoil by ripping or chiseling the subsoil a minimum of three passes, to a depth of approximately 18 inches. Rip or chisel in alternating cross patterns if practical. Avoid damage to subsurface features (e.g. pipe, electrical lines, etc.) If large clay clods or rocks are brought to the surface during ripping, consult with Keystone to modify the procedure.<br>**2.** Test decompacted subsoil at representative, regular intervals and compare to adjacent, undisturbed areas with the same soil type and moisture condition. Keystone to determine the adequacy of decompaction.<br>**3.** Grade or disk subsoil to break any subsoil clods to less than 6 inches average diameter. Smaller subsoil clods minimize subsequent mixing between subsoil and topsoil.<br>**4.** Remove rocks that have been exposed on the surface due to construction activity prior to topsoil replacement. Any rock left on the Yard or Facility must be of equivalent quantity, size, and distribution to that on immediately adjacent lands. Rock may be removed manually or with a rock picker provided that topsoil preservation is assured. Rock removed from the Yard or Facility shall be removed from the landowner's premises and properly disposed of, or, disposed of on the landowner's premises at a location that is mutually acceptable to the landowner and Keystone.<br>**5.** Replace salvaged topsoil to pre-existing depths. Regrade the Yard or Facility to insure that final grade matches adjacent contour.<br>**6.** Ensure that drainage from the site is similar to pre-construction conditions unless otherwise directed by the landowner and Keystone. |
| **SEEDBED PREPARATION:** | **1.** Disc or harrow the regraded site to produce a consistent seedbed with topsoil clods typically less than 3 inches in diameter.<br>**2.** Prepare a seedbed that is free of competing vegetation and not subject to excessive erosion. A firm seedbed will ensure that seed is placed at the proper depth. |
| **SEEDING METHOD** | Drill Seeding<br>**1.** Drill seeding will be the primary method of seeding Yards and Facilities.<br>**2.** Seeding equipment should provide proper seed depth, uniform seeding rate, and good seed to soil contact. The row spacing shall not exceed 8 inches unless approved by Keystone.<br>**3.** Drill seeding equipment must be of the range or reclamation type commonly used for applying grass and/or fluffy seed (e.g. Truax or Keystone approved equivalent). The drill seeder must regulate the seed application rate and planting depth and shall be equipped with press wheels. Planting depth shall be regulated by depth bands or coulters. Seed must be uniformly distributed in the drill hopper during drilling operation.<br>**4.** Seeding depths shall be at least ¼ inch and a maximum of ½ inch.<br>**5.** The drills shall be calibrated to monitor seeding rate and operated at an appropriate speed to maintain the specified seeding rate and depth.<br>Broadcast Seeding<br>**1.** Broadcast seeding will typically be conducted on steep slopes, rocky areas, and in confined areas as needed with Keystone direction.<br>**2.** When broadcast seeding, double seed application rates from those shown for drill seeding.<br>**3.** Broadcast seeding will not be completed during high wind periods as determined by Keystone.<br>**4.** Seed will be broadcast using manually or mechanically operated cyclone-type bucket spreaders or a drop-seeder (e.g. Brillion). Seed will be mixed as necessary to prevent bridging.<br>**5.** Broadcast seeding by hand shall be with a Cyclone shoulder strap broadcast spreader or a Keystone approved equivalent. Distributing seed by hand without a mechanical broadcaster will not be allowed.<br>**6.** Following any broadcast seeding, good seed/soil contact shall be established by dragging a roller harrow or flexible meadow harrow over the seeded area. All seed that is broadcasted shall be dragged unless otherwise specified by Keystone. On small areas, hand ranking may be used to cover seed.<br>**7.** Hydraulic seeding equipment (hydro-seeder) may be used per Keystone direction. |
| **SEED MIX AND RATE:** | Keystone will provide an appropriate seed mix for each site unless otherwise agreed to with the landowner. |
| **SEEDING DATE:** | Seeding dates will vary depending upon the ecological region of the Yard or Facility and will be specified by Keystone. |
| **PERMANENT EROSION CONTROL:** | Install any permanent erosion control items consistent with the CMR Plan and Keystone direction. Typical erosion control may include:<br>• Cover crops as specified by Keystone.<br>• Straw mulch or biodegradable tackifier applied at a rate recommended by the manufacturer. Straw lengths will be approximately 8 inches. Straw mulch will be uniformly applied at 2 tons per acre and crimped to a depth of 2 to 3 inches. Crimping shall be completed with a crimper (not a farm disc) or tracked vehicle in excessively steep terrain. |

| RECLAMATION OF PIPE YARDS AND CONTRACTOR YARDS (In Sandy Prairie Areas) | |
|---|---|
| **TOPSOIL SALVAGE THROUGH CLEANUP** | **1.** Complete these procedures as described for RECLAMATION OF CONTRACTOR CAMPS, PIPE YARDS AND CONTRACTOR YARDS |
| **DECOMPACTION AND REGRADING:** | **1.** Do not decompact subsoil unless directed by Keystone<br>**2.** Replace salvaged topsoil to pre-existing depths and adjacent contour.<br>**3.** Ensure that drainage from the site is similar to pre-construction conditions unless otherwise directed by the landowner and Keystone. |
| **SEEDBED PREPARATION:** | **1.** Disc or harrow the regraded site to produce a consistent seedbed with topsoil clods typically less than 3 inches in diameter. If clods are typically less than 3 inches once topsoil has been respread, do not disc or harrow.<br>**2.** Prepare a seedbed that is free of competing vegetation and not subject to excessive erosion. A firm seedbed will ensure that seed is placed at the proper depth. |
| **SEEDING METHOD** | **1.** Yards and Facilities within Sandy Prairie areas will be drill seeded and broadcast seeded.<br>**2.** Drill and broadcast seed according to methods described for RECLAMATION OF PIPE YARDS AND CONTRACTOR YARDS (In Non-Sandy Prairie Areas). |
| **SEED MIX AND RATE:** | Keystone will provide an appropriate seed mix for each site unless otherwise agreed to with the landowner. Sufficient seed will be provided to drill seed and broadcast seed each Yard or Facility within Sandy Prairie Areas. Bags will be labeled to identify which will be used for drill seeding, and which will be used for broadcast seeding. |
| **SEEDING DATE:** | Seeding dates will be based on regional ecological requirements and will be specified by Keystone. |
| **PERMANENT EROSION CONTROL:** | Install any permanent erosion control items consistent with the CMR Plan and Keystone direction. Typical erosion control may include:<br>• Cover crops as specified by Keystone.<br>• Straw mulch or biodegradable tackifier applied at a rate recommended by the manufacturer. Straw lengths will be approximately 8 inches. Straw mulch will be uniformly applied at 2 tons per acre and crimped to a depth of 2 to 3 inches. Crimping shall be completed with a crimper (not a farm disc) or tracked vehicle in excessively steep terrain. |

# 3. Supporting Emails and Letters

**Phone Conversation with Dr. Dave Wedin on July 17th 2008 at 2:30pm**
Grasslands Ecologist
University of Nebraska - School of Natural Resources
402-472-9608 (o)
402-730-8543 (c)

**Seed Suggestions:**
Use mixture of warm and cool season grasses
Species composition is very important

**Other Comments:**
Northerly winds in March/April are the most erosive. Winds switch to southerly in late May.
If our client is interested in working with a university partner, they would be interested
Upland - Native grasses, 85% of area. Lowlands - More non-native species, moist hay meadows, 15% of area.
South Dakota has more invasive species than Nebraska
Will need to develop a plan to keep out invasive species

**References:**
Walton John - looking into success of seeding along highways throughout the Sandhills
Dave Stock - provides seed mixes and most likely tailors mixes to the Sandhills region

**Phone Conversation with Dr. Jerry Volesky on July 15th 2008 at 12:30pm**
Associate Professor - Extension Range and Forage Specialist
University of Nebraska Cooperative Extension
308-696-6710

**Challenges:**
Wind erosion potential
Heavy rain
Native grasses often slow to establish
Most of sandhills are pasture land - how to fence of area without completely cutting pasture land in half? Specific stabilized areas for cattle to cross?
Variable rain - trouble growing seed if no rain

**Blowouts:**
Usually caused by cattle near watertanks or along oddly shaped fencing

**Seed Suggestions:**
Use native seed: 3 to 4 species of warm season grasses as well as 1 to 2 species of cool season grasses in seed mix
Native seed is often very slow to establish
Use of a cover crop along with native seed is important for faster establishment (such as rye/wheat/oat)

**Mulch Suggestions:**
Spread mulch, hay, tree branches over disturbance
Crimp mulch/hay into ground

**Other Suggestions:**
Use temporary fencing to protect vegetation from livestock until it is well established
Strip & replace topsoil - important for the successful re-establishment of vegetation (even though it may look like all the other sand out there)

**Other Comments:**
"110 feet of disturbance is really not that significant"
ridges tend to oriented in NW to SE direction from prevailing winds
most suceptible to erosion when crossing ridges
Two types of areas: meadows and rolling hills/dunes. Meadows have higher water table, are subirrigated, have high organic content, and erosion is not much of a concern
Sandhills Biocomplexity Project - used herbicide to kill plants - no erosion seen until area was disked - root matting remained intact and stabilized soil until sufficient subsoil disturbance occurred.

**References:**
Nebraska Department of Roads - usually use mulch and sometimes matting on steep slopes
Use past knowledge from pipelines through the area
South Dakota State University - Eric Mousel and Sandy Smart (both are grassland/rangeland specialists who previously worked at University of Nebraska)
Will send several journal publications
  Bluestem-Sandreed Establishment
  Erosion-Blowouts
  Revegetation Sandhills
  Seedbank Characteristics-Sandhills

**My Thoughts:**

Dr. Volesky was very helpful and is a great resource with good information about seed and mulch.  However, he did not know very much about other types of BMPs such as wind fence, soil stabilizers, wattles, etc…

**Phone Conversation with Bob Atkenson on July 17th 2008 at 3pm**
Area Engineer
NRCS - Holt County, Nebraska
402-336-3796

**Seed Suggestions:**
Use the typical critical area seed mix & then mulch at 4000 lbs/acre of prairie hay mulch - will email me the seed mix

**Other Suggestions:**
Can use waterbars on steep slopes, snow fence in windy areas, hay/straw bales where necessary

**Other Comments:**
South Dakota will have more water erosion issues and require typical controls like silt fence

**My Thoughts:**
May have some experience and good information, but not very willing to take time and talk to me over the phone.

**Phone Conversation with Dr. David Loope on July 17th 2008 at 9:30am**
Geosciences Professor
University of Nebraska
402-472-2647

**Other Suggestions:**
Mould surface to existing contours
Plant grass as well as shrubs

**Other Comments:**
Department of Roads has fairly large cuts and fill on the N-S highways, and it does not look like they have trouble stabilizing the area - "nothing looks out of control"

**References:**
Contact Hightway Department or Department of Roads - use "mesh" on slopes
"Atlas of the Sand Hills" edited by Anne Bleed and Charles Flowerday - can purchase from Nebraska School of Natural Resources

**Email from Gabe Robertson on July 18th 2008 at 2pm**
Highway Environmental Programs Specialist (Roadside Stabilization)
Nebraska Department of Roads
402-479-4685

Hi Emily,
Here are some recommendations from a couple of the folks in our Roadside Stabilization Unit. You'll see that a lot of emphasis is placed on salvaging the topsoil from the project to re-apply after construction. That can obviously have a huge impact on vegetation establishment. I know we also use a slope protection netting in specific areas where wind is a concern. This is a photo-degradable, black synthetic mesh that is placed on slopes, over the seeded and mulched area, and will help provide some wind erosion control until the vegetation has enough time to get established. Usually these nets will break down in about a year.
Please see the rest of the comments below and feel free to contact me with any other questions you have.

The most important thing is to salvage what little topsoil is there for the seed bank and soil critters that help the plants grow.
We also use a lot of composted manure and I know the maintenance people use that when they have blowouts. She might also want to check with NRCS Nebraska.

Composted manure, incorporated into the top 6", from local feedlots can also help to improve vegetation establishment

Assuming that this is a buried pipeline proposed for cattle country, the proponent should expect to place exclusion fencing to protect new seeding areas during seedling establishment and initial growth (probably needs to be fenced for the first year or two). The fences will have to be placed so that cattle can still access water, shade, nutrient blocks, etc. The proponent will want input from the affected landowners in this regard. Cattle are naturally curious, and will be drawn to anything that is new and different, fencing included.
Species composition of seed mixtures for re-vegetation will depend on what land use types the pipeline is traversing. Landowners who have tame pasture will likely want the same types of grasses post-project. Native grassland pasture-owners likely will want native species to be planted. In short, put it back like you found it to have happy landowners.
The best one thing that can be done during construction to improve re-vegetation success: salvage, store, then respread the top 8 inches of soil. This sandy stuff may not look like topsoil, but the soil microbes, the little bit of organic matter, and other biological stuff in that layer will help immensely in getting the place reclaimed.
Native grassland seeding: NDOR uses seed mixtures that are dominated by species known to tolerate sandy soils (species are provided below), used in tandem with 4 tons of prairie hay mulch per acre of disturbance, and where wind is a concern, the seeded area is overlain with staked netting.
Recommended grass species for the native grassland seed mixtures: Sand bluestem, little bluestem, sand lovegrass, sand dropseed, sideoats grama, blue grama, prairie sandreed, Canada wildrye, thickspike wheatgrass, prairie junegrass, green needlegrass (in the northern Sandhills), switchgrass, and western wheatgrass.
Quick vegetation establishment: NDOR uses a cover crop in concert with the seed mixture. Cereal rye performs well as cover crop in sandy soils. However, the cover crop grows actively for only a few months. Certain of the species listed above can get going earlier than others. NDOR relies on Canada wildrye, little bluestem, sideoats grama, sand lovegrass, sand dropseed, and thickspike wheatgrass for early establishment of permanent cover. Again, salvage and respread of topsoil is important for rapid response and success of the seeding.

**My Thoughts:**
Was very helpful over email. If there are any questions I'm sure he would be willing to talk over the phone.

| | |
|---|---|
| **From:** | Robertson, Gabe |
| **To:** | jbeaver@westech-env.com |
| **Subject:** | FW: Sandhills reclamation |
| **Date:** | Wednesday, April 29, 2009 8:34:39 AM |
| **Attachments:** | SECTION 810.docx |

John,

Here are some answers to your questions. I also attached the NDOR Slope Protection Spec for your reference.

Let me know if you need anything else.

Gabe

Thanks for your additional help. I have a couple of specific questions regarding procedures the highway department has used to reclaim road cuts in the Sandhills.

1. What application rate (tons/acre) do you use when adding composted manure to a site?

We typically use manure on the shoulders, 0.2 cy per linear yard; I think the goal is to have 2-3" depth. On steep slopes we use native hay broadcast and drilled as Carol described. Slope protection netting is placed over the hay. I've attached the latest version of the specification.

2. What equipment do you use to apply composted manure to steep slopes and what equipment do you use to work the manure into the soil on steep slopes? Generally use a regular manure spreader and then disk lightly into the soil.
3. Do you ever incorporate woody debris or other items when backfilling an area to provide subsoil structure and prevent erosion? Woody debris - - no. Crimped mulch is used frequently, as is erosion control netting.
4. Do you typically broadcast seed or hydro-seed steep slopes? Not sure about steep slopes, but the typical method for Sandhills projects is to drill at a lighter rate (a 3000 square yard rate seeded over one acre, then broadcast the remainder of the seed over the soil surface prior to application of mulch.
5. What total seed rate do you apply (pounds PLS/acre)? Please specify if this rate is for drill seeding or broadcast seeding. NDOR uses a mixture of cool- and warm-season grasses, legumes and forbs that total between 35-45 PLS pounds per acre. As indicated in #4, that quantity is drilled AND broadcast.

They might want to consider using a bonded fiber matrix application over steep slopes.

# TransCanada-Keystone XL 3LSHOLQH 3URMHFW

## Contact Record

| | |
|---|---|
| Date/Time: **6.30.10 0900-1300** | Meeting Phone Conversation E-Mail (attach) *(highlight)* |

| | |
|---|---|
| Agency/Organization(s): | NRCS – Nebraska State Office<br>WESTECH Environmental Services, Inc. |

| | |
|---|---|
| Person(s) Involved: | Mike Kucera (State Resource Conservationist – NRCS), Cam Loerch (State Soil Scientist – NRCS), Dan Shurtliff (Soil Scientist – NRCS)<br>John Beaver, Lisa Larsen, WESTECH |

**Notes**: JB stated the purpose of the meeting was to describe the project, explain reclamation planning and techniques, address questions and concerns and incorporate recommendations where possible on Spreads 8, 9 and 10 in Nebraska. JB outlined the Fall 2009 reclamation surveys, explained how the CON/REC units were developed, and showed how alignment sheets are used. The NRCS was generally impressed with the amount of reclamation planning that has been accomplished. Questions and concerns are summarized below.

MK: Suggested reviewing Range Site and Ecological Site information.

MK: What is the consistency of the product in the line? JB/LL did not know – will find out.

MK: Mulch rates – NRCS recommends 2 tons hay/straw per acre without tackifer and 1 ton hay/straw per acre with tackifer on slopes $\geq$5 percent. NRCS favors native grass hay in the Sandhills and believes it is more available than straw and probably cheaper. JB described typical mulching techniques.

MK: Recommended using NRCS Standards for mulching (484), companion crops (550 DP), and cover crops (550 DP and 340). LL stated they were used.

MK/
CL/DS: Need to avoid WRP's (Wetland Reserve Program) in York and Wheeler counties. JB thought they had been avoided – will check. MK said NRCS previously gave this information to TransCanada.

There was considerable concern regarding potential impacts to wetlands known as "rainwater basins" that are associated with Filmore, Scott and Marr Lake soils in Merrick, York and Filmore counties. Need to avoid draining them and should treat as a pothole. The group looked at potential rainwater basins near MP's 768, 770 and 775. Need to identify via SURGO data base and provide mitigation.

JB: Sandhills Reclamation – JB discussed re-routes, soil salvage, erosion control, seeding and fencing. MK/CL/DS recommended salvaging 8-10" rather than 6-8", matting slopes $\geq$30 percent (which JB said was already the plan), and using native hay as mulch (which JB and LL agreed to present to TransCanada).

MK: Use drill seed when possible in Sandhills. Drill rates should be 60 PLS per square foot, 120 PLS per square foot if broadcasting, exclusive of companion crop. Should utilize seeding windows in 550 DP; LL explained that seeding along a pipeline is difficult due to access issues, replaced fences, etc. The NRCS is concerned that seeding grass outside of the recommended timeframes will result in substantial revegetation failure. MK was very clear that the NRCS would not recommend or condone seeding grass outside of the appropriate season.

Rated cover/companion crops from best to worst: oats, wheat, triticale, cereal rye.

For seedbed preparation, dirt clods should be no larger than 2-3 inches diameter.

Does not want crested wheatgrass seeded in Nebraska. Between MP 598.2 - 599.2 in the first 2-3 miles of northern Nebraska, crested wheatgrass fields were documented at two locations for a total of about 1800 feet (4-5 acres). Presumably the landowner wants it reseeded to crested, so no changes will be made. The IPH-IP mix which also includes crested wheatgrass is not prescribed anywhere in Nebraska.

Seed mixes - see attached CON/REC units showing track changes.

| | |
|---|---|
| Is follow up required? | 1. Find out what the physical consistency of the oil product in the pipeline is.<br>2. Confirm that no WRP's are crossed by Project.<br>3. Identify rainwater basins and provide mitigation. |

| | |
|---|---|
| Commitments made: | 1. Change salvage depth in Sandhills from 6-8" to 8-10" on alignment sheets.<br>2. Specify matting on slopes $\geq$30% in Sandhills. We believe this is already done but will check language in DTL 4.<br>3. Confirm there is no IPH-CW in Nebraska (done). |

| | |
|---|---|
| Recorded by: | Lisa Larsen, John Beaver, WESTECH |

| | |
|---|---|
| **From:** | Lisa Larsen |
| **To:** | "Kucera, Michael - Lincoln, NE" |
| **Cc:** | "John Beaver"; Jonathan.Minton@trow.com; jennifer.collins@trow.com; Jon.Schmidt@trow.com |
| **Subject:** | Keystone XL Project Reclamation |
| **Date:** | Tuesday, July 20, 2010 1:21:54 PM |
| **Attachments:** | NEB ConRec revisions.pdf |

Hello Mike-

John Beaver and I very much appreciated meeting with you, Dan Shurtliff and Cam Loerch on June 30 to discuss the Keystone XL Project. I have attached revised CON/REC units showing changes made in response to your feedback in track change mode to facilitate your review.

We have not yet determined the consistency of the pipeline product but will let you know when we find out. We are in the process of confirming that no WRP's are crossed by the project and identifying the potential presence of rainwater basins. We did determine that the ONLY crested wheatgrass proposed in Nebraska is in two existing crested WG fields in the first 2-3 miles of northern Nebraska (4-5 acres); assuming this is what the landowner desires, we'll use CWG in these two locations only.

Please let us know if you have any questions or concerns, or require additional information.

Lisa Larsen

# TransCanada-Keystone XL

## Contact Record

| Date/Time: **July 26, 2011 10:30 am and 4:30 pm** | Meeting  Phone Conversation  E-Mail (attach)  *(highlight)* |
|---|---|

| Agency/Organization(s): | Nebraska Game Fish and Parks/WESTECH |
|---|---|

| Person(s) Involved: | Gerry Steinauer (NGFP)/ John Beaver (WESTECH) |
|---|---|

**Notes:**

I called Gerry to discuss his concerns relative to seed source for revegetation on the Keystone XL project through the Sandhills of Nebraska. Gerry had submitted several concerns that basically indicated that he thought cultivars of native grasses were unacceptable, that seed rates for the project were too high, and that locally grown, non-cultivar native seed was available in sufficient quantity to reseed KXL through the Sandhills.

I discussed these concerns with Gerry but stated that we had worked with the NRCS both at the state level and the county level, as well as individuals with University of Nebraska and the Nebraska Department of Roads to develop the seed mixes and seed rates. I stated that the high seed rates were by design and request of the NRCS per their Critical Area Planting guidelines and that the seed mix rate is actually less than what the highway department uses. I stated that our experience on other projects where local seed was required made us skeptical of using local collection here, particularly in the Sandhills where revegetation is such a concern, because it usually results in very low seed rates. We always try to seed high rates so that all of the available niches receive seed and the probability of seed germinating and growing is greater. I informed Gerry that we were adamant about using adequate seed rates of known, high-quality seed as this was our best insurance of obtaining adequate revegetation quickly. We also discussed that the fact that cultivars are more robust and aggressive than non-cultivars is a benefit to revegetation.

I told Gerry that we were not categorically opposed to including local ecotype seed in the mix but that it had to be of acceptable germination and viability and that if there wasn't enough of it we would round out the mix with cultivars to achieve an adequate seed rate. I also said that if particular cultivars were problematic we were willing to discuss which cultivars we should acquire first.

Gerry expressed his concern about interbreeding between the cultivars and native, adjacent plants, but he also saw our concern and seemed willing to compromise. He said he would visit with USFWS and some local growers/seed collectors to see if they could actually provide the required amount of seed.

Gerry called me back around 4:00 pm and said that he had spoken with growers and the USFWS. He basically had three points:

1. He said that for some species, such as big bluestem, there would probably be enough seed that is grown by producers – not collected in the wild – but is also of a preferred variety to satisfy the project's needs. He said that for other species there probably was not enough supply to satisfy the demand if cultivars from several sources were not used. In these cases cultivars would be acceptable.

2. Gerry said that the USFWS did not consider reseeding with cultivars in ABB habitat to be adequate mitigation and that if cultivars were used the mitigation payments would be higher. Gerry said that the USFWS had noted that some species, such as smooth brome (which is a non-native grass and therefore not included in the Marsh Plains of Sandhills seed mix), are rhizomatous and can impede ABB burying their prey. Gerry pointed out to the USFWS that several native grasses, including those that grow in ABB habitat are also rhizomatous. I don't believe the USFWS had much of a response to this.

3. The EIS would probably state that Keystone will have to consult with USFWS and NDGFP on seed mixes in the Sandhills.

Gerry asked if pipelines typically reseed wetlands. I said not unless required by the USACE since wetlands typically revegetate quickly on their own with appropriate species that are present prior to construction. Gerry indicated that this was his experience also.

In summary it seems that there is opportunity to discuss meeting the concerns of the NDGFP and USFWS regarding seed source and also Keystone's concerns regarding seed rates and seed quality. However, this option will probably not be available for areas designated as ABB habitat because the USFWS has decided that only native ecotypes of locally collected seed will suffice as mitigation. Personally I doubt that there is any research whatsoever that compares ABB use of habitat dominated by cultivars of native species to habitat dominated by non-cultivars of native species.

| | |
|---|---|
| Is follow up required? | Generally this issue should be pursued with USFWS, NDGFP, and NRCS, etc. to resolve the problem. |

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| Commitments made: | none |

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|---|---|
| Recorded by: | John Beaver |

# TransCanada-Keystone XL

## Contact Record

| Date/Time: **September 14, 2011/12:45 pm** | Meeting Phone Conversation E-Mail (attach) *(highlight)* |
|---|---|

| Agency/Organization(s): | University of Nebraska / WESTECH Environmental Services, Inc. |
|---|---|

| Person(s) Involved: | Dr. David Wedin / John Beaver |
|---|---|

**Notes:**

I contacted Dr. David Wedin to make sure he knew about the upcoming meeting among USFWS, NEGFP, NRCS, and UNL personnel, and to inquire if he would be able to attend. Dr. Wedin indicated that he may not be able to attend due to class schedules but that he would like to and would see if it would be possible to arrange a substitute teacher in his absence.

Since Dr. Wedin may not be able to attend the meeting, we discussed some of the concerns he had raised in emails and testimony, with particular emphasis on determining his opinion on cultivars of native grasses for revegetation, and other reclamation procedures. The following items were discussed:

Native Seed Cultivars: Dr. Wedin is in favor of using locally derived/adapted cultivars of native grasses to the extent possible. I responded that Keystone is completely willing to use all available cultivars of locally derived native seed. It is the project's preference to use the best, most consistent, abundant, and site adapted seed possible. We discussed the impracticality of obtaining adequate quantities of locally collected ecotype seed. I told Dr. Wedin that we had contacted over 20 seed suppliers and that none could supply locally collected seed on a PLS basis at anywhere close to the amounts we needed. Dr. Wedin was not surprised at this result and commented on the continuing and ongoing debate among botanists regarding "racial purity" as he put it of revegetation seed. We discussed the varieties of cultivars he would suggest for the project and determined the following preferred varieties: Goldstrike for sand bluestem, Goshen for prairie sandreed, Blaze for little bluestem, Nebraska 28 for switchgrass and Nebraska 27 for sand lovegrass. All of these varieties were already listed on our Sandhills conrec unit seed mix but it was useful to get his opinion so that we can prioritize preferred varieties.

Cool season grasses: Dr. Wedin thinks that rhizomatous cool season grasses should be a greater component of the seed mix, however, he also stated that there aren't many cool season grasses available that are locally derived from the Sandhills. We did discuss one cool season grass, Kentucky bluegrass, as a possible inclusion in the mix. We noted that it's debated whether this is a native, I stated that based on our research it is probably not a native and that we almost never seed it, and that it comes in quickly on its own in mesic environments. We discussed Canada widlrye which is a cool season rhizomatous grass and that we've included in the seed mix, although as Dr. Wedin noted in a previous email comment, the species is not noted for growing in the eastern Sandhills. I stated that NDOR apparently used this pretty extensively and recommended it. Western wheatgrass, which is also in the mix and Dr. Wedin had noted may not occur in the eastern Sandhills, was recommended by the state NRCS office. I also noted that USFWS does not want rhizomatous grasses (cool season or warm season) because, based on research regarding smooth brome, they think rhizomatous grasses will negatively affect American Burying Beetle. We both noted the irony of this given that many native grasses where ABB occur are rhizomatous. However, Keystone is fully in favor of using native cool season rhizomatous grasses if we can get clear direction from agencies.

Fencing: Dr. Wedin believes the ROW should be fenced to prevent excess cattle grazing. I responded that Keystone was willing to fence areas, particularly steep slopes, to prevent excess grazing and that this has to be coordinated with landowners since some want fencing, others don't, and if fencing is installed we want to make sure that water sources, trails, gates, etc. aren't cut off from use.

Forbs and Shrubs: We discussed including forbs and shrubs in the seed mix. I responded that we weren't opposed to this but that based on monitoring on other projects, forbs (including native perennial forbs) respond quickly to disturbance and are quick pioneers. He noted that there aren't many shrubs in the Sandhills other than sand cherry. We talked about planting bare root stock, which WESTECH has done on some projects, and that unless there's a particular visual area or other special resource that you don't get much for the effort since it's difficult to get enough shrubs to plant in large quantities throughout the project. (As a side note there aren't many sand cherry crossed by the project).

Mulch: Dr. Wedin thinks that native hay mulch could be helpful on the project as it will contain seeds of several species that we would like to volunteer on the ROW. I responded that the project is certainly willing to use native hay, particularly if it can be crimped into the soil so it doesn't just blow away. Dr. Wedin indicated, though, that most native Sandhills hay is actually from the sub-irrigated meadows rather than the upland stabilized dunes, so that some of the species in the hay probably wouldn't grow well in the drier dunes.

Fire: Dr. Wedin believes a fire control plan should be specifically developed for the project. He stated that wildfires can burn thousands of acres in a short time in the Sandhills. I responded that I frankly didn't know what Keystone's requirements/commitments were in this area. We discussed the natural fire return interval in the Sandhills which Dr. Wedin thought might have been around 10 years.

In summary, the conversation was cordial and helpful. My impression is that Dr. Wedin is clearly in favor of using cultivars as long as the project prioritizes getting those cultivars that are derived from Sandhills origin – this is Keystone's preference anyway. He would also like to see more cool season rhizomatous grasses in the mix but stated that once the mix is built around a "backbone" of locally derived native grass cultivars, that he isn't sure what other seed mix recommendations would be. Other than this, Dr. Wedin's overall concern is that commitments that are stated or alluded to in the FEIS are consistently implemented including follow-up monitoring and repair as necessary.

| | |
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| Is follow up required? | Check on potential for conference call connection if Dr. Wedin cannot make it to Grand Island for the meeting. |

| | |
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| Commitments made: | None specifically with Dr. Wedin although we will pursue the preferred varieties of native grasses assuming that USFWS does not preclude their use. |

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|---|---|
| Recorded by: | John Beaver |

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|---|---|
| **From:** | Jonathan Minton |
| **To:** | Kucera, Michael - NRCS, Lincoln, NE; Martha_Tacha@fws.gov; mike.fritz@nebraska.gov; gerry.steinauer@nebraska.gov; GibsonKN@state.gov; "dwedin1@unl.edu"; "jvolesky1@unl.edu"; Vickers, Shaun - NRCS, Lincoln, NE |
| **Cc:** | Jon Schmidt; Stephen Craycroft; John Beaver |
| **Subject:** | Final seed mix meeting minutes from 9-22-11 |
| **Date:** | Monday, October 31, 2011 1:55:28 PM |
| **Attachments:** | KXL Phase IV USFWS NGPC NRCS Sandhills Seed Mix Meeting 10-31-11 (FINAL).doc |

All,

Thank you for your input and time in finalizing the seed mixes in the sand hills region of Nebraska. The final meeting minutes with the seed mixes are attached for your files.

Thanks,

*The new identity of* ***Trow Engineering Consultants, Inc.***


**Jonathan Minton**
Environmental Project Manager
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USA

KXL Phase IV (. H\ VWRQH; / 3LSHOLQH3URMHFW)

USFWS, NGPC, and NRCS Meeting – Grand Island USFWS Office

9/22/11 1:00 PM – 3:00 PM

Attendees:

Martha Tacha (USFWS), Mike Fritz (NGPC), Gerry Steinauer (NGPC), David Wedin (UNL), Jerry Volesky (UNL), Mike Kucera (NRCS), John Beaver (Keystone/Westech), and Jonathan Minton (Keystone/exp)

On the Phone: Nicole Gibson (DOS) and Steve Craycroft (Keystone)

**Meeting Objectives**

The purpose of the meeting was to review the seed mix that had been developed for the sand hills region of Nebraska and come to final seed mix approved by NGPC, USFWS, and NRCS.

**Issues / Comments**

- Keystone presented the seed mix that had been developed through multiple agency consultations. There was a significant discussion on sand hills species and sub-irrigated fields species as well as use of cultivars. Keystone then presented the Sandhills and Marsh Plains con/rec units and seed mixes.

- Keystone presented information on availability of locally collected native seed and discussed the seed rates necessary to ensure reclamation success.

- It was agreed within the meeting that cultivars were appropriate but that preference would be given to cultivars developed in Nebraska or adjacent states.

- Mike Kucera provided NRCS information on cultivars and seeding rates (after the meeting he emailed a seed mix calculator utilized by NRCS for Keystone to use).

- The following native grasses and cultivars were identified during the meeting and agreed to as most appropriate for use in the Sandhills. Most of these species were present in the original Sandhills seed mix, however, the cultivars were prioritized during the meeting and seed rates were adjusted by using the seed rate calculator that was provided by Mike Kucera on September 26. Seed rates are shown at a broadcast rate. It was discussed in the meeting that seed would be drill seeded at half the broadcast rate and then overseeded using a broadcast seeder, a method that has been used successfully by the Nebraska Department of Roads.

| **Seeding Mixture:** | Sandhills | | | | | **Preferred Varieties** | | |
|---|---|---|---|---|---|---|---|---|
| **Species Number** | **Species** | **PLS Lbs/Ac** | **PLS/Sq Ft** | **Percent in Mix** | **NRCS Allowable Percentage Range** | **1st Choice** | **2nd Choice** | **3rd Choice** |
| 134 | Western wheatgrass | 1.25 | 3.16 | 2.5 | 0 - 5 | Rodan | Rosana | Barton |
| 96 | Sand bluestem | 12.00 | 31.13 | 24.3 | 20 - 40 | Goldstrike | Garden County | Champ |
| 15 | Blue grama | 0.25 | 4.73 | 3.7 | 0 - 10 | Bad River | -- | -- |
| 77 | Prairie sandreed | 3.25 | 20.42 | 16.0 | 15 - 25 | Goshen | Pronghorn | -- |
| 99 | Sand lovegrass | 0.50 | 14.92 | 11.7 | 5 - 15 | Nebraska 27 | -- | -- |
| 24 | Canada wildrye | 1.25 | 3.30 | 2.6 | 0 - 5 | Mandan | -- | -- |
| 59 | Little bluestem | 4.50 | 26.86 | 21.0 | 15 - 25 | Camper | Pastura | Blaze |
| 122 | Switchgrass | 1.50 | 13.40 | 10.5 | 5 - 15 | Nebraska 28 | Pathfinder | -- |
| 51 | Indiangrass | 2.50 | 10.04 | 7.8 | 5 - 15 | Holt | Nebraska 54 | -- |
| | | | | | | | | |
| **TOTALS** | | | 127.96 | 100 | | | | |

* Allowable percentages based on Sands, Sandy, Shallow Sandy and Sandy Lowland Ecological Sites in Eastern Sandhills of Nebraska. NRCS NE-T.G. Notice 600 (Range Planting S-550)

- The following native grasses and cultivars were identified during the meeting and agreed to as most appropriate for use in the Marsh Plains. Most of these species were present in the original Marsh Plains seed mix, however, the cultivars were prioritized during the meeting and seed rates were adjusted by using the seed rate calculator that was provided by Mike Kucera on September 26. Seed rates are shown at a drill rate. These seed rates were submitted for review by the group on 10.25.2011 and were revised as shown below by Mike Kucera on 10.26.2011.

| **Seeding Mixture:** | Marsh Plains | | | | | **Preferred Varieties** | | |
|---|---|---|---|---|---|---|---|---|
| **Species Number** | **Species** | **PLS Lbs/Ac** | **PLS/Sq Ft** | **Percent in Mix** | **NRCS Allowable Percentage Range** | **1st Choice** | **2nd Choice** | **3rd Choice** |
| 9 | Big bluestem | 6.00 | 22.73 | 33.5 | 30 - 40 | Pawnee | Champ | Bonanza |
| 122 | Switchgrass | 1.00 | 8.93 | 13.2 | 5 - 20 | Nebraska 28 | Pathfinder | Forestburg |
| 59 | Little bluestem | 1.75 | 10.45 | 15.4 | 10 - 20 | Camper | Pastura | Blaze |
| 51 | Indiangrass | 4.00 | 16.07 | 23.7 | 15 - 30 | Holt | Nebraska 54 | -- |
| 24 | Canada wildrye | 1.25 | 3.30 | 4.9 | 0 - 5 | Mandan | -- | -- |
| 134 | Western wheatgrass | 2.50 | 6.31 | 9.3 | 0-20 | Rodan | Rosana | Barton |
| | | | | | | | | |
| **TOTALS** | | | 67.79 | 100 | | | | |

* Allowable percentages based on Subirrigated Ecological Sites in Eastern Sandhills of Nebraska. NRCS NE-T.G. Notice 600 (Range Planting S-550)

- Mike Kucera offered the following collection radii for non-varietal seed that might be used on the project:
  - *Warm Season Grass Seedlots without a Variety Stated on the seedtag (includes source identified, VNS, Native Harvest, Common, etc.):*
  - • South - 250 miles (southern sources should be given preference over seed from northern sources.)
  - • North - 150 miles
  - • East or West - 200 miles

- Mike Kucera also provided internet links to seeding and mulching NRCS publications NE550DP and NE 484DP, which have been utilized in developing the seeding and mulching specifications for the project.