Appendix I

SUPPLEMENTAL INFORMATION FOR COMPLIANCE WITH THE
MONTANA ENVIRONMENTAL POLICY ACT AND SUPPORT FOR DECISIONS
UNDER THE MAJOR FACILITY SITING ACT

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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 III3 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 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 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 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	Miles of Land Crossed (except where noted)		
	2010 Proposed Route Segment	MTV-1	Difference
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	Miles of Land Crossed (except where noted)		
	2010 Proposed Route Segment	MTV-1	Difference
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

Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1 (Miles of Land Crossed, except where noted)	Difference	Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1 (Miles of Land Crossed, except where noted)	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

Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1a (Miles of Land Crossed, except where noted)	Difference	Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1a (Miles of Land Crossed, except where noted)	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

Item	Miles of Land Crossed (except where noted) 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

Item	Miles of Land Crossed (except where noted) 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) KEY-6	MTV-2a	Difference
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) KEY-6	MTV-2a	Difference
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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2010 Proposed Route Segment**	**MTV-3**	**Difference**	**Item**	**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							
	Miles of Land Crossed (except where noted)				**Miles of Land Crossed (except where noted)**		
Item	**2009 Proposed Route Segment**	**MTV-5**	**Difference**	**Item**	**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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**KEY-25**	**MTV-5a**	**Difference**	**Item**	**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

Item	Miles of Land Crossed (except where noted)				
	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	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-7	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-7	Difference
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

Item	2010 Proposed Route Segment	MTV-9	MTV-9b	MTV-9e	MTV-9f	MTV-9g	MTV-9j	MTV-9m
	Miles of Land Crossed (except where noted)							
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

Item	2010 Proposed Route Segment	MTV-9	MTV-9b	MTV-9e	MTV-9f	MTV-9g	MTV-9j	MTV-9m
	Miles of Land Crossed (except where noted)							
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	Miles of Land Crossed (except where noted) MTV-10	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	Miles of Land Crossed (except where noted) 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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**MTV-11**	**Difference**	**Item**	**2009 Proposed Route Segment**	**MTV-11**	**Difference**
Length	3.58	3.48	+0.10	**Slope**			
Land Cover				< 5%	1.81	1.31	+0.50
Developed	0.08	0.10	-0.02	≥ 5% and ≤ 15%	1.77	1.94	-0.17
Forested/ Woodlands	0.21	0.08	+0.13	> 15% and ≤ 30%	0.00	0.23	-0.23
Wetlands	0.04	0.00	+0.04	> 30%	0.00	0.00	0.00
Total	0.33	0.18	+0.15	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.34	2.03	-0.69	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	2.24	1.45	+0.79	**Structures**			
Total	3.58	3.48	-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	3.58	3.48	+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%)	1 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	3.58	3.48	+0.10	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	7	-3	Sage-grouse Leks within 3 miles	0	0	0
Total	4	7	-3	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	1	0	+1	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	**Biology (survey data)**			
Total	2	2	0	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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	2010 Proposed Route Segment	MTV-13	Difference	Item	2010 Proposed Route Segment	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) 2010 Proposed Route Segment	MTV-14	Difference	Item	Miles of Land Crossed (except where noted) 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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2010 Proposed Route Segment**	**MTV-16**	**Difference**	**Item**	**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	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-17	Difference
Length	1.88	2.11	-0.23	**Slope**			
Land Cover				< 5%	0.89	0.62	+0.27
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.99	1.49	-0.50
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.04	0.04	0.00	> 30%	0.00	0.00	0.00
Total	0.04	0.04	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.50	1.88	-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	0.38	0.23	+0.15	**Structures**			
Total	1.88	2.11	-0.23	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	1.00	-1.00	**Cultural Resources (Class III)**			
Private Land	1.88	1.11	+0.77	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	1.88	2.11	-0.23	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	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	1	1	0
Intermittent Streams	1	1	0	**Biology (survey data)**			
Additional USGS Streams	0	1	-1				
Total	1	2	-1	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) 2010 Proposed Route Segment	MTV-18	Difference	Item	Miles of Land Crossed (except where noted) 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) KEY-46	MTV-19a	Difference
Length	3.43	3.74	-0.31
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	1.99	2.80	-0.81
Irrigated Land	0.00	0.00	0.00
Hay Land	1.44	0.94	+0.50
Total	3.43	3.74	-0.31
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	3.43	3.74	-0.31
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	3.74	-0.31
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	1	1	0
Additional USGS Streams	1	2	-1
Total	3	4	-1

Item	Miles of Land Crossed (except where noted) KEY-46	MTV-19a	Difference
Slope			
< 5%	2.24	2.17	+0.07
≥ 5% and ≤ 15%	1.18	1.47	-0.29
> 15% and ≤ 30%	0.01	0.10	-0.09
> 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	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
Biology (survey data)			
Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0
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	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-20	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	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-20	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)			Item	Miles of Land Crossed (except where noted)		
	2010 Proposed Route Segment	MTV-23	Difference		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	Miles of Land Crossed (except where noted) MTV-24	Difference
Length	3.10	3.12	-0.02
Land Cover			
Developed	0.08	0.07	+0.01
Forested/ Woodlands	0.00	0.06	-0.06
Wetlands	0.00	0.00	0.00
Total	0.08	0.13	-0.05
Revenue Final Land Unit Classification			
Range Land	2.98	2.38	+0.60
Irrigated Land	0.00	0.00	0.00
Hay Land	0.12	0.74	-0.62
Total	3.10	3.12	-0.02
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	3.10	3.12	-0.02
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	3.10	3.12	-0.02
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	5	4	+1
Total	5	4	+1
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	2	7	-5
Total	3	8	-5

Item	Miles of Land Crossed (except where noted) KEY-29	Miles of Land Crossed (except where noted) MTV-24	Difference
Slope			
< 5%	0.44	0.57	-0.13
≥ 5% and ≤ 15%	1.90	2.04	-0.14
> 15% and ≤ 30%	0.73	0.43	+0.30
> 30%	0.03	0.08	-0.05
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 Elg. (100%)	1 Elg. (96%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (96%)	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	1	1	0
Sharp-tailed Leks within 4 miles	1	1	0
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	MTV-25	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-25	Difference
Length	1.50	1.54	-0.04	**Slope**			
Land Cover				< 5%	1.19	0.67	+0.52
Developed	0.02	0.04	-0.02	≥ 5% and ≤ 15%	0.26	0.86	-0.60
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.05	0.01	+0.04
Wetlands	0.00	0.04	-0.04	> 30%	0.00	0.00	0.00
Total	0.02	0.08	-0.06	**Water Wells within 100 ft**	1	1	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.02	1.54	-0.52	Residences within 25 ft	0	0	0
Irrigated Land	0.48	0.00	+0.48	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	1.50	1.54	-0.04	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	1.50	1.54	-0.04	Cultural Findings (% Surveyed)	1 Not Elg. (100%)	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	0	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	1.50	1.54	-0.04	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	1	1	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	1	1	0	**Biology (survey data)**			
Total	2	2	0	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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**KEY-35**	**MTV-26**	**Difference**	**Item**	**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

	Miles of Land Crossed (except where noted)		
Item	**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

	Miles of Land Crossed (except where noted)		
Item	**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	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-28 (Miles of Land Crossed, except where noted)	Difference	Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-28 (Miles of Land Crossed, except where noted)	Difference
Length	0.17	0.17	0.00	**Slope**			
Land Cover				< 5%	0.07	0.07	0.00
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.06	0.08	-0.02
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.04	0.02	+0.02
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	0.17	0.17	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	0.17	0.17	0.00	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	0.17	0.17	0.00	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	1	1	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	0.17	0.17	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	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	1	1	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	1	1	0	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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2010 Proposed Route Segment**	**MTV-29**	**Difference**	**Item**	**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	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	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	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	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 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) 2009 Proposed Route Segment	Miles of Land Crossed (except where noted) KEY-1	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	Miles of Land Crossed (except where noted) 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	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-2	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-2	Difference
Length	3.43	3.38	+0.05	**Slope**			
Land Cover				< 5%	2.06	1.31	+0.75
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.36	1.73	-0.37
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.30	-0.30
Wetlands	0.00	0.00	0.00	> 30%	0.01	0.04	-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	3.43	3.38	+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	0.00	0.00	0.00	**Structures**			
Total	3.43	3.38	+0.05	Structures within 25 ft	0	1	-1
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.40	0.00	+0.40	**Cultural Resources (Class III)**			
Private Land	3.03	3.38	-0.35	Cultural Findings (% Surveyed)	2 Pot. Elg. (100%)	3 Pot. Elg. (100%)	-1 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	3.43	3.38	+0.05	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	7	4	+3	Sage-grouse Leks within 3 miles	0	0	0
Total	7	4	+3	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	4	7	-3	**Construction Costs**			
Total	4	7	-3	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
Length	2.90	2.89	+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	2.90	2.89	+0.01
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	2.90	2.89	+0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	2.90	2.89	+0.01
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	2.90	2.89	+0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	6	-4
Total	2	6	-4
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	2	0
Additional USGS Streams	4	6	-2
Total	6	8	-2

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-3	Difference
Slope			
< 5%	1.19	1.66	-0.47
≥ 5% and ≤ 15%	1.61	1.10	+0.51
> 15% and ≤ 30%	0.10	0.13	-0.03
> 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)	13 Pot. Elg. (100%)	7 Pot. Elg. (100%)	+6 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	$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

	Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**KEY-13**	**Difference**
Length	3.30	3.28	+0.02
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.04	0.06	-0.02
Total	0.04	0.06	-0.02
Revenue Final Land Unit Classification			
Range Land	1.84	1.69	+0.15
Irrigated Land	0.00	0.00	0.00
Hay Land	1.46	1.59	-0.13
Total	3.30	3.28	+0.02
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	2.29	2.44	-0.15
U.S. Bureau of Land Management	1.01	0.84	+0.17
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	3.30	3.28	+0.02
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	4	5	-1
Total	4	5	-1
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	2	-1
Additional USGS Streams	2	0	+2
Total	3	2	+1

	Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**KEY-13**	**Difference**
Slope			
< 5%	2.63	2.87	-0.24
≥ 5% and ≤ 15%	0.61	0.38	+0.23
> 15% and ≤ 30%	0.06	0.03	+0.03
> 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	4	1	+3
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	1 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	1	1	0
Sharp-tailed Leks within 1 mile	1	1	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
Construction Costs			
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	Miles of Land Crossed (except where noted) KEY-15	Difference
Length	1.93	1.96	-0.03
Land Cover			
Developed	0.06	0.04	+0.02
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.06	0.04	+0.02
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	1.93	1.96	-0.03
Land Ownership			
State of Montana	0.78	0.96	-0.18
Private Land	1.15	1.00	+0.15
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	1.93	1.96	-0.03
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	1	1	0
Additional USGS Streams	1	1	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	Miles of Land Crossed (except where noted) KEY-15	Difference
Slope			
< 5%	1.48	1.36	+0.12
≥ 5% and ≤ 15%	0.31	0.36	-0.05
> 15% and ≤ 30%	0.13	0.18	-0.05
> 30%	0.01	0.06	-0.05
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	5	-4
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	3 Pot. Elg. (100%)	1 Pot. Elg. (100%)	+2 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	$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
Length	0.81	0.81	0.00
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	0.81	0.81	0.00
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	0.81	0.81	0.00
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.00	0.00	0.00
U.S. Bureau of Land Management	0.81	0.81	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	0.81	0.81	0.00
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	1	1	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-17	Difference
Slope			
< 5%	0.02	0.00	+0.02
≥ 5% and ≤ 15%	0.34	0.38	-0.04
> 15% and ≤ 30%	0.40	0.42	-0.02
> 30%	0.05	0.01	+0.04
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)	1 Pot. Elg. (100%)	1 Pot. 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	2	2	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	6	6	0
Sharp-tailed Leks within 4 miles	8	8	0
Construction Costs			
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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**KEY-24**	**Difference**	**Item**	**2009 Proposed Route Segment**	**KEY-24**	**Difference**
Length	2.15	2.19	-0.04	**Slope**			
Land Cover				< 5%	0.28	0.26	+0.02
Developed	0.04	0.18	-0.14	≥ 5% and ≤ 15%	1.57	1.58	-0.01
Forested/ Woodlands	0.01	0.00	+0.01	> 15% and ≤ 30%	0.30	0.35	-0.05
Wetlands	0.00	0.03	-0.03	> 30%	0.00	0.00	0.00
Total	0.05	0.21	-0.16	**Water Wells within 100 ft**	1	0	+1
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.87	0.68	+0.19	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.28	1.51	-0.23	**Structures**			
Total	2.15	2.19	-0.04	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	2.15	2.19	-0.04	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	2.15	2.19	-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	2	4	-2	Sage-grouse Leks within 4 miles	0	0	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	0	0	0	**Construction Costs**			
Additional USGS Streams	3	5	-2	Cost per mile	$2,100,000	$2,100,000	
Total	3	5	-2	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

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-27	Difference
Length	2.01	2.00	+0.01
Land Cover			
Developed	0.16	0.17	-0.01
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.11	0.02	+0.09
Total	0.27	0.19	-0.08
Revenue Final Land Unit Classification			
Range Land	1.31	1.31	0.00
Irrigated Land	0.00	0.00	0.00
Hay Land	0.70	0.69	+0.01
Total	2.01	2.00	+0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	1.90	2.00	-0.10
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.11	0.00	+0.11
Total	2.01	2.00	+0.01
Number of Road Crossings			
Major Roads	2	2	0
Minor Roads	1	0	+1
Total	3	2	+1
Number of Railroad Crossings	1	1	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	2	0	+2
Total	3	1	+2

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-27	Difference
Slope			
< 5%	0.74	0.50	+0.24
≥ 5% and ≤ 15%	1.18	1.35	-0.17
> 15% and ≤ 30%	0.09	0.15	-0.06
> 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	1	0	+1
Structures within 500 ft	2	1	+1
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Elg. (100%)	1 Elg., 1 Not Elg. (100%)	-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	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	$4,221,000	$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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**KEY-28**	**Difference**	**Item**	**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	KEY-29	Difference	Item	2009 Proposed Route Segment	KEY-29	Difference
	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
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	Miles of Land Crossed (except where noted) KEY-31	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	Miles of Land Crossed (except where noted) 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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**KEY-32**	**Difference**	**Item**	**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
Length	1.13	1.14	-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	1.13	1.14	-0.01
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	1.13	1.14	-0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.13	0.22	-0.09
U.S. Bureau of Land Management	1.00	0.92	+0.08
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.13	1.14	-0.01
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	2	2	0
Additional USGS Streams	0	0	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-35	Difference
Slope			
< 5%	0.33	0.37	-0.04
≥ 5% and ≤ 15%	0.79	0.77	+0.02
> 15% and ≤ 30%	0.01	0.00	+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	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	1	1	0
Sage-grouse Leks within 4 miles	2	2	0
Sharp-tailed Leks within 1 mile	1	1	0
Sharp-tailed Leks within 2 miles	2	2	0
Sharp-tailed Leks within 3 miles	3	3	0
Sharp-tailed Leks within 4 miles	3	3	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
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	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-37	Difference
Length	4.09	4.09	0.00	**Slope**			
Land Cover				< 5%	1.07	0.85	+0.22
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	2.35	2.99	-0.64
Forested/ Woodlands	0.12	0.00	+0.12	> 15% and ≤ 30%	0.58	0.25	+0.33
Wetlands	0.08	0.02	+0.06	> 30%	0.09	0.00	+0.09
Total	0.20	0.02	+0.18	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	3.75	3.78	-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	0.34	0.31	+0.03	**Structures**			
Total	4.09	4.09	0.00	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.05	-0.05	**Cultural Resources (Class III)**			
Private Land	4.09	2.89	+1.20	Cultural Findings (% Surveyed)	1 Not Elg. (100%)	1 Not Elg. (100%)	0
U.S. Bureau of Land Management	0.00	1.15	-1.15				
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	4.09	4.09	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	4	2	+2	Sage-grouse Leks within 3 miles	0	0	0
Total	4	2	+2	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	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 3 miles	1	1	0
Intermittent Streams	2	2	0	Sharp-tailed Leks within 4 miles	4	4	0
Additional USGS Streams	6	1	+5	**Construction Costs**			
Total	8	3	+5	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	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-41	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-41	Difference
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

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	2009 Proposed Route Segment	KEY-47	Difference	Item	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.

I-2.6 REFERENCES CITED

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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

	Concern				
Stream	Turbidity	Incision	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

Federal Emergency Management Agency (FEMA). 1981. Guidelines for Determining Flood Flow Frequency.

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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 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 Forested and Scrub-Shrub Wetlands Crossed 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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Keystone. 2009b. Keystone XL Project Supplemental Environmental Report. TransCanada Keystone Pipeline, LP. Document No.: 10623-006, July 2009. Wetlands.

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
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.

I-3.3.3 REFERENCES CITED

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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

[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 White-tailed Deer, Mule Deer, and Pronghorn Winter Ranges 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 White-tailed Deer, Mule Deer, and Pronghorn Winter Ranges 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 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.

I-3.4.3 REFERENCES CITED

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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 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 land[9] (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 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 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 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 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 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

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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

	Population			Annual Average Change in Population	Annual Average Change in Population	Population Density (per square mile)	
County	**1990**	**2000**	**2007**	**1990-2000**	**2000-2007**	**2000**	**Population Center**
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 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 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 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 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 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]					
	Operations Budget ($)				
City/Town	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 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 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 8-Hour Average	35 ppm[a] 9 ppm[a]	23 ppm[b] 9 ppm[b]	Primary Primary
Fluoride in Forage	Monthly Average Grazing Season	- - - -	50 µg/g[c] 35 µg/g[c]	- - - -
Hydrogen Sulfide	Hourly Average	- -	0.05 ppm[b]	- -
Lead	90-Day Average Quarterly Average Rolling 3-Month Average	- - 1.5 µg/m^3 0.15 µg/m^3 [c]	1.5 µg/m^3 [c] - - --	- - Primary & Secondary Primary & Secondary
Nitrogen Dioxide	Hourly Average Annual Average	0.100 ppm[d] 0.053 ppm[e]	0.30 ppm[b] 0.05 ppm[f]	Primary Primary & Secondary
Ozone	Hourly Average 8-Hour Average	0.12 ppm[g] 0.075 ppm[h]	0.10 ppm[b] - -	Primary & Secondary Primary & Secondary
Particulate matter less than 10 microns in diameter	24-Hour Average Annual Average	150 µg/m^3 [i] - -	150 µg/m^3 [j] 50 µg/m^3 [k]	Primary & Secondary Primary & Secondary
Particulate matter less than 2.5 microns in diameter	24-Hour Average Annual Average	35 µg/m^3 [l] 15 µg/m^3 [m]	- - - -	Primary & Secondary Primary & Secondary
Settleable Particulate	30-Day Average	- -	10 g/m^2 [c]	- -
Sulfur Dioxide	Hourly Average 3-Hour Average 24-Hour Average Annual Average	- - 0.50 ppm[a] 0.14 ppm[a] 0.030 ppm[e]	0.50 ppm[i] - - 0.10 ppm[b] 0.02 ppm[f]	- - Secondary Primary 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. Land used for aboveground facilities, access roads, and the permanent ROW would be an irretrievable commitment. 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. 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. 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