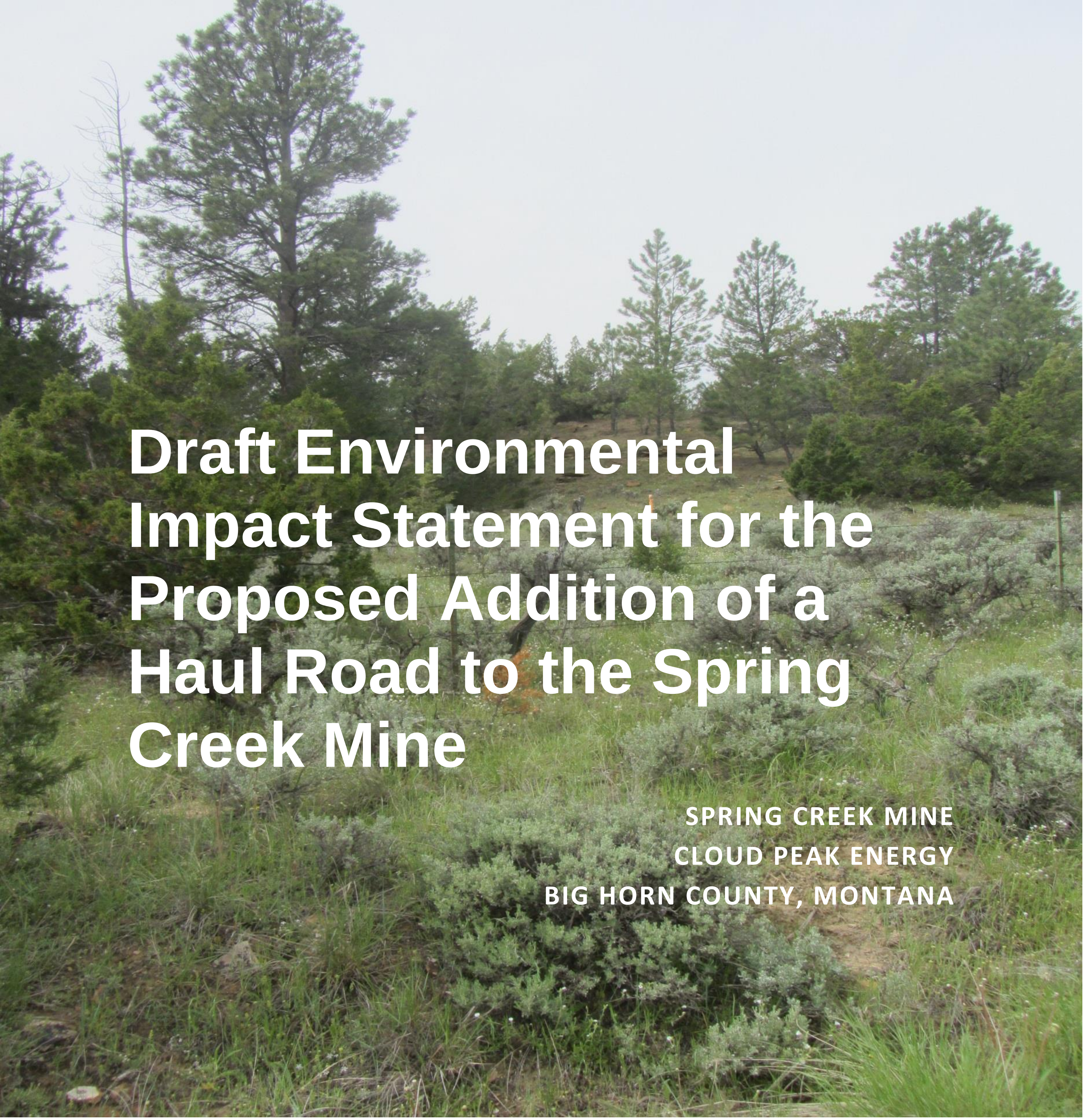

Draft Environmental Impact Statement for the Proposed Addition of a Haul Road to the Spring Creek Mine

SPRING CREEK MINE
CLOUD PEAK ENERGY
BIG HORN COUNTY, MONTANA

JUNE 2018

Montana Department of Environmental Quality

Draft Environmental Impact Statement for the Proposed Addition of a Haul Road to the Spring Creek Mine

Spring Creek Mine
Cloud Peak Energy
Big Horn County, Montana

June 2018

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DEQ
Montana Department
of Environmental Quality

July 2, 2018

RE: Notice of release, public comment period, and public meeting for the Draft Environmental Impact Statement for the Proposed Spring Creek Coal Amendment

Dear Interested Party:

The Montana Department of Environmental Quality (DEQ) has released a Draft Environmental Impact Statement (EIS) for an amendment application to the Surface Mining Permit C1979012 submitted by Spring Creek Coal LLC. The amendment application called AM5 (Arrowhead Amendment), requests adding approximately 4,334 acres to the current permit area for the establishment of a haul road. The haul road would connect the Spring Creek Mine, located near Decker, MT, with the Youngs Creek Mine in Wyoming.

This proposed amendment by Spring Creek Coal does not expand mining in additional areas or add additional tons of coal reserves to the mine plan. Spring Creek Coal is proposing construction and operation of a haul road and associated supporting facilities, as well as an above-ground powerline within the transportation corridor. The proposed haul road extends for approximately nine miles in Montana and is located on surface owned by Cloud Peak Energy, except for the crossing of one parcel of State of Montana School Trust land.

The EIS evaluates the environmental impacts resulting from the project, pursuant to the requirements of the Montana Environmental Policy Act (MEPA). The EIS analyzes in detail the No Action Alternative, and the Agency Modified Alternative. The Draft EIS analyzed potential impacts of the proposed amendment in Montana as required by MEPA.

The Draft EIS is available for public comment from July 2, 2018 – August 1, 2018. All comments become part of the public record for this project and are available for public review, along with the name(s) of the commenter(s). The Draft EIS has been posted on DEQ's website at (http://deq.mt.gov/Public/eis). An electronic version is available at the Big Horn County Public Library, 419 N. Custer Ave, Hardin, MT.

A public meeting will be held on Tuesday, July 17, 2018, to allow for stakeholders to submit oral comments on the Draft EIS. The meeting will be held from 6:00 to 8:00 pm at the Big Horn County Extension Office in the LBH Center, 317 N. Custer Ave, Hardin, Montana.

The proposed amendment application is available for the public to view at the Department of Environmental Quality offices in Helena (2001 11th Avenue, Building B) and at the Spring Creek Mine, Decker, MT. Electronic copies of the application may be viewed by visiting the website (http://deq.mt.gov/Public/ea/coal).

Comments on the Draft EIS must be received by Wednesday, August 1, 2018. Comments may be submitted at the public meeting or electronically using the DEQ Public Comment Portal at
http://svc.mt.gov/deq/publiccomment/CommentPeriod/Inactive?Key=YYENX

Written comments may also be submitted to the following address:

Craig Jones
Department of Environmental Quality
P.O. Box 200901
Helena, MT 59601

The DEQ will make reasonable accommodations for those with disabilities who wish to participate in the meeting. If you require an accommodation, please contact Craig Jones at 406-444-0514 or crajones@mt.gov.

Sincerely,

Tom Livers

Tom Livers
Director
Department of Environmental Quality

Enclosed: CD of the Draft EIS

Executive Summary

This Executive Summary provides an overview of the draft Environmental Impact Statement (EIS) for the proposed amendment to Spring Creek Mine's (SCM) Surface Mine Permit known as AM5. The draft EIS describes the resources potentially affected by the proposed amendment activities. This summary does not provide all the information contained in the draft EIS. If more detailed information is desired, please refer to the draft EIS, its appendices, and the reports referenced within.

This EIS presents descriptions of the Proposed Action and alternatives, including the No Action alternative and agency modified alternative (Chapter 2); descriptions of the affected environment for all potentially affected resources (Chapter 3); and an analysis of the impacts of the alternatives.

Purpose and Need

The Montana Department of Environmental Quality's (DEQ) purpose and need in conducting the environmental review is to act upon SCM's proposal for an amendment to their existing Surface Mining Permit for a transportation corridor in compliance with the Montana Strip and Underground Mine Reclamation Act (MSUMRA), Section 82-4-201, *et seq*., MCA.

The Montana Environmental Policy Act (MEPA) (Section 75-1-201, *et seq*., MCA) requires an environmental review of actions taken by the State of Montana that may significantly affect the quality of the human environment. This EIS was prepared to fulfill MEPA requirements. DEQ will decide which alternative should be approved in DEQ's Written Findings based on information provided in the amendment application and the analysis in the final EIS. DEQ's Written Findings would be published no sooner than 15 days after publication of the final EIS. The final EIS will include comments received on the draft EIS and the agency's responses to substantive comments.

Project Location and History

The SCM is a surface coal mine located in Big Horn County near the Tongue River Reservoir north of Decker, Montana (**Figure ES-1**). Construction of the SCM began in April 1979, and production began in December 1980. The mine has been in active production since December 1980. The AM5 permit amendment area extends south of the existing SCM permit boundary to the Wyoming border. On December 30, 2015, DEQ received an amendment application (AM5) for Surface Mining Permit C1979012 from Cloud Peak Energy (CPE). AM5 would add approximately 4,334 acres to the approved permit area for the purpose of a transportation corridor south of the existing permit boundary. The transportation corridor would provide a means to move coal from the Youngs Creek Mine (YCM) in Wyoming to the SCM for processing.

No Action Alternative

MEPA requires an analysis of the No Action Alternative for all environmental reviews that include an alternatives analysis. The No Action Alternative provides a comparison of environmental conditions without the proposal and establishes a baseline for evaluating the Proposed Action and the other alternatives. MEPA requires the consideration of the No Action Alternative, even if it fails to meet the purpose and need or would not be able to satisfy environmental permitting standards.

Under the No Action Alternative, the AM5 amendment area would not be added to SCM's Surface Mining Permit. SCM would continue to operate the mine and process coal produced within their current permit area. At an average production rate of approximately 18 million tons per year from coal mined at SCM, the mine life is expected to last up to 12 years, or until approximately 2030 (SCM Permit 17.24.303(1)(s)). It is possible that coal from other mines could continue to be processed at SCM beyond 2030, and future leases, if granted, may extend the anticipated life of mine. The reclamation plan filed with SCM's current Surface Mine Permit would be followed at the conclusion of mining activity.

Proposed Action Alternative (AM5)

SCM has submitted an amendment application for Surface Mining Permit C1979012. This amendment application, referred to as AM5, is for a transportation corridor, contained entirely within Montana, which would extend the permit boundary of the SCM to the State of Montana border. This proposed transportation corridor would allow for connecting SCM with the YCM in Wyoming. The addition of the proposed transportation corridor would allow SCM to extend the life of the mine to 2030 with reclamation completed by 2034. SCM has proposed a haul road and associated high voltage distribution line as the Proposed Action for the transportation corridor. As previously stated, the haul road would primarily be used to transport coal from a currently permitted mine, YCM, in Wyoming to the processing facility at SCM where the coal would be processed and then transported off site under the existing SCM permit. The AM5 area is not an expansion of the area to be mined.

The proposed AM5 area encompasses approximately 4,334 acres extending south of the existing mine permit boundary (**Figure ES-1**). The area to be disturbed includes the following project components: the road alignment, a high voltage distribution line, soil stockpiles, sediment and settling ponds, other sediment control features, culverts, fences, and appropriate safety features.

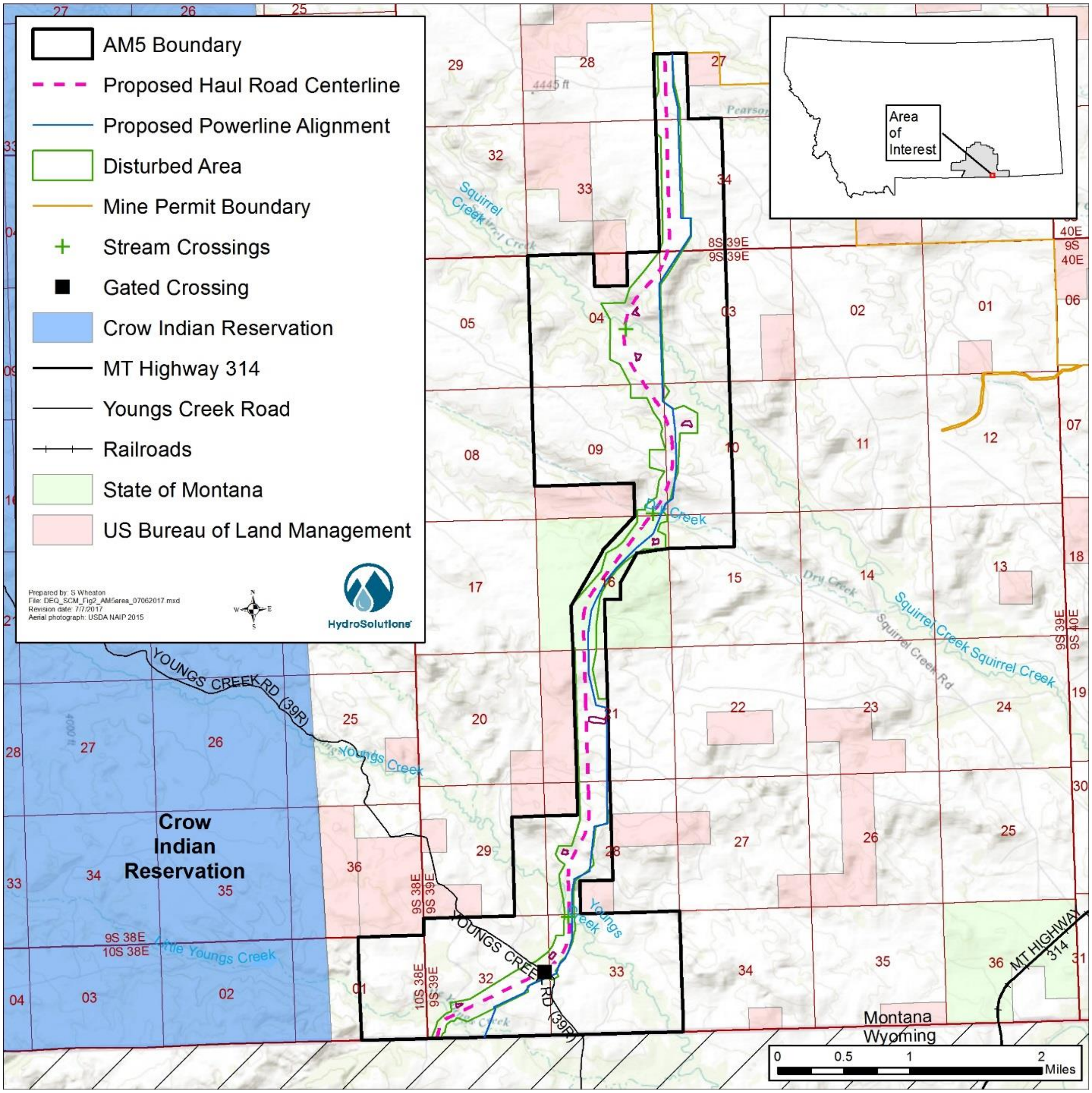

Figure ES-1. Location of the AM5 permit area.

The SCM permit area currently covers approximately 13,460 acres. The life of the mine under its most recent permit is estimated at 18 years with mining operations expected to conclude by 2030 and reclamation to be completed by 2034. The anticipated annual production from the entire SCM property ranges from 10 million tons to 30 million tons. If AM5 is approved, this range would include coal tonnage brought to SCM from other properties via the AM5 haul road. SCM estimates that of the 4,334 acres within the AM5 area, approximately 970 acres would be disturbed to complete the roadway and associated features. Approximately 303 acres of the disturbed area would constitute the roadway footprint and would be actively used during the life of the project. **Figure ES-1** shows the proposed road centerline and high voltage distribution line alignments. The road crossing at County Road 39R (Youngs Creek Road) would be controlled with a gate system when mine traffic crosses the intersection.

Road Design and Construction
The road alignment would be approximately nine miles long and would have a driving width of 120 feet. The largest vehicles anticipated to be used on the road would be 240-ton class haul trucks that require a 12-foot high by 25-foot wide safety berm (See Section 2.3.6). An above-ground 34.5 kilovolt (kV) high voltage distribution line would roughly parallel the road alignment to the east (Section 2.3.5).

SCM anticipates that approximately 6.5 million cubic yards of cut and fill would be necessary over the nine-mile alignment (Ackerman 2017f). To accommodate the 2:1 allowable slope for construction equipment to operate on the berms safely, the width of the base of the road structure will vary from 250 to 800 feet wide. Average width of the road base would be approximately 296 feet. The total acreage disturbed or encompassed by the road bed would be approximately 303 acres (**Table 2.3-1**). The road earthwork was designed to allow for a balance between cut and total fill needed. The road will be constructed by cutting and filling overburden to the grades and lines required for safe hauling by using the mine equipment fleet available at SCM or by a contractor. All applicable regulations would be followed during all phases of construction, operation, and reclamation to minimize surface disturbance, sediment delivery to streams, noise and dust, and impacts to wildlife, and to maximize vegetation recovery.

There are five named waterways that intersect the AM5 permit area. Proceeding from north to south these are: Pearson Creek, Squirrel Creek, Dry Creek, Youngs Creek, and Little Youngs Creek. In addition to these named waterways, there are several tributary drainages within the AM5 boundary. The proposed haul road alignment would cross three perennial streams (Squirrel, Youngs, and Little Youngs Creeks) and one major ephemeral stream (Dry Creek). The proposed alignment would not intersect Pearson Creek. The culvert crossings of Youngs Creek inside of the AM5 would have a shaped concrete channel that would concentrate low flows ensuring flowing water (when available) to minimize adverse impacts to aquatic life.

The road plans call for 35 culverts to direct runoff under the roadway at 31 crossing sites (SCM 2015). The culverts planned range in diameter from 12 inches (1 foot) to 264 inches (22 feet). Thirty of the culverts are five feet in diameter or smaller and five range in size from 10 to 22 feet **(Appendix A**). The largest culverts would be placed at the major stream crossings. Details on the sediment and drainage controls during construction and operation are provided in Section 2.3.

Transport Operations
SCM proposes to transport coal along the roadway using the same 240-ton class haul trucks it operates within the mine, currently Komatsu 830E AC drive trucks. These trucks are approximately 22 feet tall and 24 feet wide and have a total empty vehicle weight of 362,000 pounds (181 tons) (Komatsu 2009). The Komatsu trucks have a maximum speed of 40 mph and run on diesel fuel and an electric drive that enhances traction and braking power. The nominal payload for a Komatsu 830E AC is 488,650 pounds (244.3 tons) (Komatsu 2009). SCM has six Komatsu 830E AC trucks that would be tasked with daily hauling. Additional support traffic along the route would include supervisor and crew transportation, scrapers, graders, water trucks for dust control, maintenance and blasting equipment, and lube and fuel trucks (Ackerman 2017b, 2017h). SCM proposes to haul 24 hours a day, seven days a week, 365 days per year (Ackerman 2017g). Average daily traffic for the haul route would include four haul trucks per hour and one to two support vehicles per hour for a total of approximately 120 to 145 vehicle trips per day (Maunder 2017).

Reclamation
SCM estimates that the proposed haul road would be closed sometime in 2030 or 2031. Upon closure of the road, the disturbed area would be reclaimed using a process identical to mined land reclamation described in SCM's current permit. Upon abandonment, the haul road would be graded to the final contours as shown on the approved postmining contour map, provided as Plate 4 in the AM5 application. All culverts and bridges would be removed as part of the restoration of the natural drainage pattern. Adequate measures such as, but not limited to, cross drains, dikes, or water bars will be used to prevent erosion during reclamation.

SCM has included information on how the postmine topography would be constructed, soiled, and seeded to benefit wildlife in their AM5 application. In general, reseeding would be intended to fit the planned post-reclamation land use. These plans are part of the mine reclamation plan, but would apply to the AM5 area as well. In addition, SCM has an approved weed control plan on file with Big Horn County Weed Coordinator (ARM 7.22.2153).

In all drainages determined to be Alluvial Valley Floors (AVF), alluvial soils will be salvaged. Construction across the AVFs in Squirrel Creek, Youngs Creek, and Little Youngs Creek will consist of removal and salvage of alluvial topsoil (~12 inches), placement of a geosynthetic separation fabric above the alluvium, then construction of the haul road using material excavated from the road corridor on the adjacent valley sides. There are no alluvial soils identified in the Dry Creek area; therefore, Dry Creek will be constructed and reclaimed as any other upland ephemeral drainage.

Areas disturbed in construction of support facilities such as roads, high voltage distribution line, culverts, and fences would not be completely reclaimed until the conclusion of mining and coal processing operations. Once the AM5 roadway is no longer in use, structures that exist above the post-mining topography (PMT) elevations would be removed and all areas graded to approved contours.

SCM conducts a number of regular mining-related, environmental monitoring and data-gathering activities, as approved by the DEQ, outside of the SCM permit boundary, most of which require no significant disturbance. Resource–specific post-closure monitoring plans for groundwater, surface water, vegetation, wildlife, soils, and weather are contained in the permit. These activities would continue on all areas within the AM5 area until final bond release.

Agency Modified Alternative

Under this alternative DEQ would require SCM to implement additional environmental protection measures that are above and beyond the requirements of MSUMRA. These measures are conceptual in nature and were designed to minimize environmental effects and to address issues identified during scoping and interagency consultation.

The Agency Modified Alternative (AMA) includes mitigations developed in cooperation with the Sage Grouse Program, the DEQ Coal Bureau, and SCM (**Appendix B**). Each mitigation measure was developed to address specific environmental impacts and to avoid, minimize, rectify, or eliminate these impacts during the three stages of the Proposed Action - construction, operation, and reclamation. Mitigations focused on reducing noise, minimizing impacts to greater sage-grouse and other wildlife, complying with Executive Orders 12-2015 and 21-2015, protecting cultural resources, improving public safety, and reducing impacts to waterways, vegetation, and wetland habitats. Section 2.4 describes the mitigations in greater detail and **Table 2.4-1** summarizes each mitigation, its resource area focus, and which measures SCM has voluntarily agreed to implement.

Additional Mitigation Planning

The Sage Grouse Program worked with the DEQ and SCM to review the proposed AM5 amendment for consistency with Executive Order 12-2015. During project discussions conducted in early February 2018, SCM provided the Sage Grouse Program with a list, detailing efforts during project planning to select a disturbance corridor that, to the extent possible, avoided or minimized potential impacts to greater sage-grouse and their habitats during construction, operation, and reclamation. This approach was also used to balance impacts to overlapping species' needs (e.g., sage-grouse lekking and nesting raptors) to the extent practicable. Examples of these efforts, and additional voluntary actions that SCM has already implemented or has made commitments to implement on behalf of sage-grouse and their habitat, are provided in **Appendix B**. In addition to these actions, all prior DEQ permit commitments would be adhered to throughout the life of the project, including monitoring and reporting requirements.

In addition to its State permit requirements for wildlife habitat replacement, the SCM had previously developed a separate Habitat Recovery and Replacement Plan (HRRP) for sage-grouse (refer to State Mining Permit C1979012; HRRP and Section 17.24.312). The HRRP and SCM's current permit document outline multiple additional commitments to enhancing sage-grouse habitats. Those commitments are in addition to compensatory mitigation outlined below for the proposed haul road project.

Compensatory Mitigation

A collaborative process between the Sage Grouse Program and SCM identified the level of compensatory mitigation obligation for the proposed AM5 haul road project. The parties agreed to develop a compensatory mitigation approach specific to this project. Details on the rationale and specifics of this approach are provided in **Section 2.4** and **Appendix B**.

SCM committed to a compensatory mitigation obligation of $1,707,353.05 to be deposited in the Montana Sage Grouse Stewardship Fund (see MCA 76-22-111((1)(a)(ii)). Funds would be deposited after confirmation of approval for both the permit amendment and the compensatory mitigation plan, and before construction begins.

The MSGOT and the Sage Grouse Program would disburse these funds through the Stewardship Account granting process to conserve habitat and sage-grouse populations through offsite mitigation. Offsite mitigation is preferred in this case due to the existing mining activity in the immediate area and the new addition of the haul road. Any benefit of onsite mitigation would be negated until such activities were completed and disturbed lands fully reclaimed. Greater conservation benefits to sage-grouse can be secured offsite.

Issues of Concern

From the public involvement, two relevant issues were identified that should be addressed through the alternatives analysis process for the AM5 EIS—(1) the effects of the construction and operation of the transportation corridor on surface water and groundwater quantity and quality; and (2) the effects of construction and operation on area wildlife, specifically greater sage-grouse. These issues will be evaluated in detail to address impacts to resources and to help determine reasonable alternatives for the permit amendment, including the Proposed Action. The specific components of the two relevant issues are:

Issue 1: effects on quantity and quality of surface water and groundwater resources

Issue 2: effects of construction and operation on wildlife

Some of the mitigation measures proposed are outside DEQ's legal purview under MEPA. Therefore, DEQ's ability to require such measures may be limited. The interagency review by the Sage Grouse Program identified mitigations that would improve compliance with Executive Orders 12-2015 and 21-2015. There are also instances in which mitigation is possible but does not fall within the scope of any government laws or regulations. In these situations, applicants have the discretion to decide whether or not to employ mitigating measures.

Alternatives Considered and Dismissed

Under MEPA, a reasonable alternative is one that is practical, technically possible, and economically feasible. In addition, any alternative under consideration must be able to meet the purpose and need of the Proposed Action. During scoping, alternatives to the Proposed Action were suggested and discussed by agency representatives and SCM. Each alternative and the reason for dismissal is described in Section 2.6. The alternatives dismissed include: 1) a slurry pipeline, 2) a conveyor system, 3) a railroad spur, 4) using existing public roadways, 5) several alternative alignments near the proposed alignment, and 6) alternative culvert designs. Each alternative or alternative component was considered and eliminated from detailed study for a variety of reasons including operational feasibility, increased environmental consequences, and failure to meet the purpose and need of the project.

Summary of Impacts

This EIS discloses and analyzes the environmental consequences that may result from selection and implementation of the Proposed Action and alternatives described in Chapter 2. The more substantive consequences are presented in **Tables ES-1, ES-2, and ES-3** below. Detailed resource impacts analyses are provided in Chapter 3 (primary impacts) and Chapter 4 (cumulative and secondary impacts).

Table ES-1. Summary of Primary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Geology and Minerals	No substantive impacts anticipated.	Approximately 6.5 million cubic yards of material will be removed from cuts in the AM5 area and used as fill for the haul road bed. When replaced there will be some changes to the physical and chemical nature of the geologic material. Some changes to bedrock and cliff faces will not be reclaimable. No impacts to mineral resources are anticipated because the quality of the coal is less than what is considered marketable.	No aspect of the AMA would reduce or alter the volume disturbed or how it would be reclaimed.
Soils and Reclamation	No substantive impacts anticipated.	Loss of up to 970 acres of land temporarily removed from the productive soil base for the duration of the project.	Non-targeted mitigations related to the reduction of soil disturbances would have minor reduction of impacts to soils, but all other aspects of the Proposed Action would persist.
Surface and Groundwater	No substantive impacts anticipated.	Straightening naturally sinuous stream channels and the alteration of channel gradients may locally affect stream velocities and channel hydraulics and sediment transport equilibrium in the reaches captured by the proposed culverts. Compaction of valley bottom soils from large fill placement may impede shallow groundwater flow.	Other primary impacts would remain the same as those described for the Proposed Action.
Vegetation and Wetlands	The Thunder Basin CI/CP includes removal of 800 acres of conifers and revegetating those areas with shrubland and native grassland species. No other substantive impacts	Loss of up to 568 acres of shrublands for the duration of the project Loss of 13.7 acres of drainage bottom (potential wetland) for the duration of the project	No aspect of the AMA would reduce or alter the acreages disturbed.

Table ES-1. Summary of Primary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
	anticipated in the absence of the AM5 corridor.	Increased potential for spread of noxious weeds because of widespread surface disturbance.	
Wildlife	No substantive impacts anticipated. The Thunder Basin CI/CP includes several actions that may benefit wildlife in and around the AM5 area, but most are located outside of the permit boundary.	Habitat loss of 960 acres for the duration of the project. Permanent loss of sandstone outcrops, clay cliff faces, and other topographic features. Displacement of wildlife species using the AM5 permit area. Potential loss of some individuals due to roadkill, collisions with powerlines and fences, and destruction of habitat. Habitat fragmentation for the duration of the project which may cause reduced fitness.	Potential predation from perching raptors would be reduced if the high voltage distribution line is buried. The noise reduction aspects of the AMA would lessen overall impacts to wildlife during construction and reclamation. The proposed mitigation plan (**Appendix B**) expands on the items listed in **Table 2.4-1** and includes compensatory, off-site mitigation using ratios based on vegetation types and their habitat value.
Aquatics	No substantive impacts anticipated.	Loss of native stream habitat in three perennial streams (Squirrel, Youngs, and Little Youngs Creeks) and in one ephemeral stream (Dry Creek) for the life of the project. Aquatic and riparian habitat replaced by underground conveyance (culverts under road fill). Potential interruption of aquatic organisms and native fish migration both up and downstream of each culvert. Potential changes to upstream fish communities due to lack of connection.	Impacts would be the same as the Proposed Action.

Table ES-1. Summary of Primary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
		Shading may reduce stream temperatures locally Increased gradient may increase erosion locally.	
Cultural Resources	No substantive impacts anticipated.	No substantive impacts anticipated	No substantive impacts anticipated.
Socioeconomics	No substantive impacts anticipated.	Minor increase in employment opportunities. Minor impacts from the predicted 1.9 percent population increase, including impacts to schools, social services and housing	If limitations of construction hours are imposed, there may be changes to employment as the project timeline may be extended, but there would be fewer hours to work during seasonal restrictions.
Transportation and Public Safety	No substantive impacts anticipated.	Level of impact to Youngs Creek Road can be considered minimal due to low traffic volumes. Minor concerns were noted related to safety and visibility of the crossing.	Level of impact to Youngs Creek Road can still be considered minimal due to low traffic volumes. The AMA includes crossing enhancements that address the safety concerns of the proposed action alternative.
Land Use	No substantive impacts anticipated.	The haul road would cross and interrupt existing grazing lands and areas identified as Prime Farmland if Irrigated and Farmland of Statewide Importance and these areas would be taken out of production.	If fencing is incorporated along the haul road alignment, grazing lands and farmland would still be disturbed, but fencing could be used to minimize the amount of disturbance to these uses
Visual Resources	No substantive impacts anticipated.	Physical and visual modification and disruption of native landforms and vegetation pattern. All non-daylight activities would be visible, the result of mobile and stationary lighting and dust illumination. The remote location would minimize the number of people affected by	Limiting hours of construction in deference to wildlife (greater sage-grouse) would largely eliminate the impact from lighting. No aspect of AMA would materially reduce the area of disturbance.

Table ES-1. Summary of Primary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
		these disturbances, but wildlife would be affected.	
Noise	No substantive impacts anticipated	Construction and reclamation activities would cause short-term noise impacts, and exceed the EPA day-night L_{dn} 55 dBA guideline at the closest residential receptor (R1). The L_{50} noise levels will exceed the EO stipulation L_{50} +10 dBA above baseline noise at nine sage-grouse leks. The long-term haul truck operations will change the acoustical environment, but are not predicted to exceed the EO stipulation L_{50} +10 dBA above baseline noise at any of the sage-grouse leks evaluated.	The proposed AMA mitigations would minimize but not eliminate all the noise of the construction or reclamation equipment. It is unlikely that the AMA construction/reclamation mitigations would reduce the noise to less than 10 dBA above ambient at six leks. The proposed AMA noise operation mitigations would not eliminate all the noise. Some changes to ambient noise levels may be noticeable.
Air Quality	No substantive impacts anticipated	Increase in up to a maximum of 246.7 tons per year of fugitive dust (PM_{10}) occurring during the operation phase.	Non-targeted mitigations related to the reduction of soil disturbances would have localized minor reductions in fugitive dust emissions from wind erosion, but all other aspects of the Proposed Action would persist.

The following table is a summary of the secondary impacts discussions in Section 4.5. Please see the resource specific subsections for more details on the rationale for these impacts.

Table ES-2. Summary of Secondary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Geology and Minerals	No substantive impacts anticipated to geology in the absence of the AM5 corridor development. Coal-bed	No substantive impacts anticipated.	No aspect of the AMA would reduce or alter the acreages disturbed.

Table ES-2. Summary of Secondary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
	methane development may be more likely if economic conditions change.		
Soils and Reclamation	No substantive impacts anticipated.	Potential for a slight increase in sediment loading downstream. BMPs and regulatory requirements would minimize this potential.	Non-targeted mitigations related to the reduction of soil disturbances would have a minor reduction in impacts to sediment loading, but all other aspects of the Proposed Action would persist.
Surface and Groundwater	No substantive impacts anticipated unless coal-bed methane or other resource development occurs.	Potential for a slight increase in sediment loading downstream. BMPs and regulatory requirements would minimize this potential.	Impacts would be the same as the Proposed Action.
Vegetation and Wetlands	The Thunder Basin CI/CP would replace 800 acres of conifers with sagebrush or grassland which would be beneficial once established. No other substantive impacts anticipated.	Potential long-term (>15 years) recovery required for up to 568 acres in the disturbed area, including the 165 acres of shrublands in the road footprint. No long-term effects anticipated for drainage bottom habitats (potential wetland) after reclamation.	No aspect of the AMA would reduce or alter the acreages disturbed.
Wildlife	No substantive impacts anticipated beyond those described under Vegetation and Wetlands.	Lost carrying capacity caused by direct habitat loss and avoidance of the AM5 area. Reduction in breeding success and individual and population fitness due to noise effects. Decreased population abundance or density of breeding individuals in habitats adjacent to the road. Higher wildlife mortality, lower reproduction rates, ultimately smaller populations and overall lower population viability during life of the project and some recovery period after.	The AMA has a number of measures to reduce project-caused noise. Therefore, there would be fewer effects to wildlife resulting from noise. Displacement, reduction in carrying capacity, reduced breeding success, and reduced population fitness would all be lessened to some extent. The AMA would lessen overall impacts to wildlife. If high voltage distribution lines are buried, secondary impacts from predation and behavioral alterations would be reduced.

Table ES-2. Summary of Secondary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
		Avoidance and abandonment of active leks by greater sage grouse due to increased activity in the area. Reduced populations of greater sage-grouse resulting from avoidance of elevated structures such as high voltage distribution lines and light poles or resulting from construction noise which exceeds 10 dBA above background. Reduced populations of greater sage-grouse resulting from fragmentation of habitats to a level no longer capable of supporting viable populations.	The approved mitigation plan would reduce secondary impacts to greater sage-grouse by providing offsite habitat improvements.
Aquatics	No substantive impacts anticipated in the absence of the AM5 corridor development.	Energy dissipation structures may "catch" sediments and reduce sediment transport downstream. Once reclamation is completed, aquatic habitat and stream connectivity is expected to recover fully within 2-5 years.	Impacts would be the same as the Proposed Action.
Cultural Resources	No substantive impacts anticipated	No substantive impacts anticipated	No substantive impacts anticipated
Socioeconomics	No substantive impacts anticipated.	No secondary impacts to socioeconomics are anticipated.	No secondary impacts to socioeconomics are anticipated.
Transportation and Public Safety	No substantive impacts anticipated.	No substantive impacts anticipated.	No substantive impacts anticipated.
Land Use	No substantive impacts anticipated.	Grazing land, Prime Farmland if Irrigated and Farmland of Statewide Importance would be reduced and taken out of production while the haul road and constructed and in use.	Impacts from Proposed Action related to loss of production would be the same. Fencing could be used to minimize disturbance to these land uses.

Table ES-2. Summary of Secondary Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Visual Resources	No substantive impacts anticipated.	Potential long-term (>15 years) recovery of native vegetation required for up to 568 acres in the disturbed area, including 165 acres of shrub lands in the road foot print. No long-term effects anticipated for bottomlands and drainages. Once the haul road section (footprint) is removed and blended back to existing grades.	No aspect of AMA would materially reduce the area of disturbance.
Noise	No substantive impacts anticipated.	Annoyance is the primary human secondary impact due to intruding noise. Possible secondary effects include stress reactions, sleep interference, efficiency reduction and fatigue. Construction, operational and reclamation noise will be audible at the two residences located within 1.5 miles of the haul road. Although some animals habituate to new noise sources (e.g., big game species), secondary impacts to wildlife occur when noise interferes with auditory signals such as breeding (e.g., sage-grouse) or communication (e.g., raptors and songbirds), causing displacement and/or nest abandonment.	The proposed AMA noise mitigations would reduce, but not eliminate the construction and reclamation noise, and therefore, secondary impacts may still exist. However, noise level measurements (monitoring) during phases of the AM5 project can confirm that noise levels are mitigated to 10 dBA below existing ambient conditions, to reduce wildlife noise impacts.
Air Quality	No substantive impacts anticipated	Slight increase in deposition of fugitive dust on water, soil, and vegetation.	No substantive impacts over those of the Proposed Action anticipated.

The following table is a summary of the cumulative impacts discussions in Section 4.2. Please see the resource specific subsections for more details on the rationale for these impacts.

Table ES-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Geology and Minerals	The disturbances associated with the related future actions described in Section 4.1 would be substantial.	The impacts to geology from proposed surface mining leases are expected to be similar to cut and fill carried out for the haul road in that it involves removal of native geologic material followed by backfilling with a mixture of overburden and spoils material, thus changing the geologic composition and appearance of the disturbed areas.	Cumulative impacts would not be substantially different from the Proposed Action.
Soils and Reclamation	The potential leases described in Section 4.1 would disturb 3,500 acres of soils as part of the coal mine development. Soils would be handled in compliance with MSUMRA and other regulations outlined in **Table 3.3.1**, which have been designed to minimize long-term effects to soil productivity and maximize revegetation potential.	The larger leases, including the TR-1, discussed under the related future actions are distant from the AM5 area. It is unlikely that any effects due to those actions would contribute to changes in soils in the AM5 area.	Cumulative impacts would not be substantially different from the Proposed Action.
Surface and Groundwater	There may be impacts to Pearson and South Fork Spring Creeks if the related future actions are approved. This would contribute to cumulative impacts due to diversion of streams in the Upper Tongue River watershed.	There is a possibility that small sediment increases across the Upper Tongue River area from project activities when combined with the related future actions would affect sediment loads, but in the context of the larger watershed the potential is unlikely to be measurable. Regulatory controls would minimize this potential (**Table 3.4-1**).	Impacts would be the same as the Proposed Action.

Table ES-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Vegetation and Wetlands	The large area of disturbance included in the proposed leases would cumulatively change the vegetation communities across the area. Because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or types and quantities of vegetation resources potentially affected beyond the acreage estimates provided in **Table 4.1.1**	Potential impacts due to mosaic of wildlife habitat from the loss of the up to 568 acres of shrublands when added to the over 3,500 acres of other surface disturbing projects proposed in the general vicinity (**Table 4.1-1**). No cumulative effects anticipated for drainage bottom habitats (potential wetland) after reclamation. Potential for non-native and noxious species to increase their overall presence in the general area due to incremental effects of other nearby projects.	Changes in grazing practices have the potential to improve localized vegetation conditions over time. No other aspect of the AMA would contribute to or reduce cumulative effects to vegetation, wetlands, or noxious weeds.
Wildlife	Removal of coal resources from an additional 3,500 acres of coal leases would result in habitat fragmentation, noise impacts, displacement, reduction in carrying capacity, reduced breeding success, and reduced population fitness.	Potentially, disturbances within the AM5 area would further reduce habitats for wildlife, result in greater habitat fragmentation. Additional wildlife would be lost during construction related activities. Cumulative reduction in habitat for wildlife. Potential for a cumulative reduction in carrying capacity in the SCM area. Wildlife dependent on the habitats which take longer to reclaim (e.g, shrub and woodland habitat) or those that would not be reclaimed (topographic features such as sandstone outcrops and cliff faces) would experience cumulative adverse impacts.	Impacts due to other actions under consideration would be the same as the Proposed Action, but mitigations described under this alternative would reduce impacts within the AM5 project area.

Table ES-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Aquatics	Loss of aquatic habitats in Pearson and South Fork Spring Creeks in the Upper Tongue River area for the life of the proposed leases would contribute to cumulative effects to aquatic resources.	Loss of aquatic habitats in multiple creeks across the Upper Tongue River area for the life of the proposed leases and AM5 project would contribute to cumulative effects to aquatic resources.	Impacts due to other actions under consideration would be the same as the Proposed Action,
Cultural Resources	Additional surface disturbances would require cultural resource inventories to avoid impacts to these areas.	No substantive impacts anticipated in addition to those described for the No Action.	No substantive impacts anticipated in addition to those described for the No Action.
Socioeconomics	No substantive impacts anticipated.	No substantive impacts anticipated.	No aspect of the AMA would contribute to or reduce cumulative effects to socioeconomics.
Transportation and Public Safety	No substantive impacts anticipated.	No substantive impacts anticipated.	No substantive impacts anticipated
Land Use	No substantive impacts anticipated after required reclamation is completed. Pre-project land uses should be able to be re-established.	No substantive impacts anticipated after required reclamation is completed. Pre-project land uses should be able to be re-established.	No aspect of the AMA would substantially contribute to or reduce cumulative effects to land use.
Visual Resources	No substantive impacts anticipated because of the remoteness of the proposed leases and uncertainty regarding the timing and arrangement of these projects.	Potential negative impacts to mosaic landforms and native vegetation due to loss of up to 568 acres. Minimum cumulative effects anticipated for landforms and native vegetation after complete landscape level reclamation. Potential for non-native species to increase their presence in the local area. This may affect the overall landscape vegetation pattern.	The AMA would have similar impacts as the Proposed Action.

Table ES-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area			
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**
Noise	Area noise levels would be expected to increase if the proposed future actions are approved. Leks located closer to the proposed leases would be affected more intensely.	Potential cumulative impacts on noise include conflicts with noise-sensitive receptors, including residences, greater sage grouse, and other noise-sensitive wildlife, such as raptors. These impacts would be intensified where other existing sources have already affected noise levels, such as adjacent SCM operations, oil and gas extraction activities, traffic on local roads and grazing activities. Future actions would also further increase the ambient noise levels, including the addition of a rail spur and additional coal extraction and production in the area.	The proposed AMA noise mitigations would not reduce all the noise of the construction or reclamation activities.
Air Quality	Large areas of surface disturbance would have the potential to contribute PM_{10} to the airshed.	Increase in fugitive dust (PM_{10}) in conjunction with permitted mine emission sources, recreational traffic in the area, wildfire, and other private land activities.	No aspect of the AMA would substantially change cumulative effects to the air quality.

Preferred Alternative

The rules and regulations implementing MEPA (ARM 17.4.617) require agencies to indicate a preferred alternative in the Draft EIS, if one has been identified. DEQ has identified certain aspects of the Agency Modified Alternative as the Preferred Alternative for the reasons discussed below.

During the required consultation process in MEPA, SCM has voluntarily committed to implement mitigations identified in the Agency Modified Alternative which are indicated in bolded rows in Table 2.4-1 of the Draft EIS. These measures are now part of the Preferred Alternative to minimize project impacts to the environment.

DEQ worked closely with the Montana Sage Grouse Habitat Conservation Program (Sage Grouse Program), who implements the Executive Order No. 12-2015 for the sage grouse conservation strategy with guidance from the Montana Sage Grouse Oversight Team (MSGOT). In the initial development of the Agency Modified Alternative, DEQ and the Sage Grouse Program developed on-site mitigation measures for the project. These on-site mitigation measures are shaded green in Table 2.4-1. These on-site measures would be retained in the Agency Modified Alternative, but would not be part of the Preferred Alternative.

While conducting the environmental analysis; DEQ, the Sage Grouse Program, and SCM realized that opportunities for effective, on-site mitigations were limited. Previous anthropogenic disturbances and the cumulative impacts of potential future projects independent of the proposed haul road are already impacting the habitat for greater sage-grouse in the area. Also, any benefits of on-site mitigation would likely be negated by the project itself and the intensive nature and permit duration of the activity now being considered. Therefore, the Sage Grouse Program recommended and the MSGOT approved on April 26, 2018 a plan which includes compensatory mitigation to accomplish off-site mitigation. Plus, SCM voluntarily committed to apply this sage grouse mitigation plan as identified in **Appendix B**.

The Preferred Alternative also includes the following mitigations:

- Blasting: Limit to daytime hours and comply with the requirements of ARM 17.24.624 and 17.24.159,
- Construction Monitoring: Having a tribal representative and/or qualified archaeologist on site during construction

There are two residences that are owned and leased out by SCM. Only one of the two residences is currently occupied. During the analysis, it was identified there could be noise impacts to these residences from the construction phase of the project. The residence in T10S R38E Section 1 is occupied currently, and SCM has committed to take reasonable steps to alleviate noise impacts during the construction phase. SCM does not have any immediate plans for future occupancy of the residence in T9S R39E Section 14.

These measures would minimize noise during construction at human and wildlife receptors near the project. During construction, having a tribal representative and/or qualified archeologist present during construction could minimize disturbances to these cultural features.

DEQ has determined that all aspects of the preferred alternative are reasonable, achievable under current technology, and economically feasible (Section 75-1-201(1)(b)(vi)(C)(I), MCA). DEQ has consulted extensively with SCM regarding all aspects of the preferred alternative, has given due weight and consideration to SCM's comments to date regarding the preferred alternative, and will do so going forward in connection with the formulation of the FEIS (Section 75-1-201(1)(b)(vi)(C)(II), MCA).

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Chapter 1 Purpose and Need For Action

1.1 Introduction

This draft environmental impact statement (EIS) was prepared for the proposed amendment to the Spring Creek Mine (SCM) permit in Big Horn County, Montana (**Figure 1-1**). On December 30, 2015, the Montana Department of Environmental Quality (DEQ) received an amendment application (AM5) for Surface Mining Permit C1979012 from Cloud Peak Energy (CPE). AM5 would add approximately 4,334 acres to the approved permit area for the purpose of a transportation corridor south of the existing permit boundary.

DEQ prepared this draft EIS to present the analysis of possible environmental consequences of three transportation alternatives: the No Action Alternative, the Proposed Action, and the Agency Modified Alternative (AMA). The action alternatives include additional mitigation measures developed by DEQ. The three alternatives are described in detail in Chapter 2.

1.2 Purpose and Need

SCM has proposed to add a haul road to connect the SCM with the Youngs Creek Mine (YCM) in Wyoming. YCM and SCM are both owned by CPE. The haul road would allow CPE to move shared equipment, personnel, and coal from YCM for blending with coal at SCM. DEQ's purpose and need in conducting the environmental review is to act upon SCM's proposal for an amendment for a haul road which is in compliance with the Montana Strip and Underground Mine Reclamation Act (MSUMRA), Section 82-4-201, *et seq.*, MCA.

The Montana Environmental Policy Act (MEPA) (Section 75-1-201, *et seq.*, MCA) requires an environmental review of actions taken by the State of Montana that may significantly affect the quality of the human environment. This EIS was prepared to fulfill MEPA's requirements. DEQ will decide which alternative should be approved in DEQ's Written Findings based on information provided in the amendment application and the analysis in the final EIS. DEQ's Written Findings would be published no sooner than 15 days after publication of the final EIS. The final EIS will include comments received on the draft EIS and the agency's responses to substantive comments.

1.3 Project Location and History

The SCM is located in Big Horn County near the Tongue River Reservoir north of Decker, Montana (**Figure 1.3-1**). Construction of the SCM began in April 1979, and production began in December 1980. The mine has been in active production since December 1980. The AM5 permit amendment area extends south of the existing SCM permit boundary to the Wyoming border.

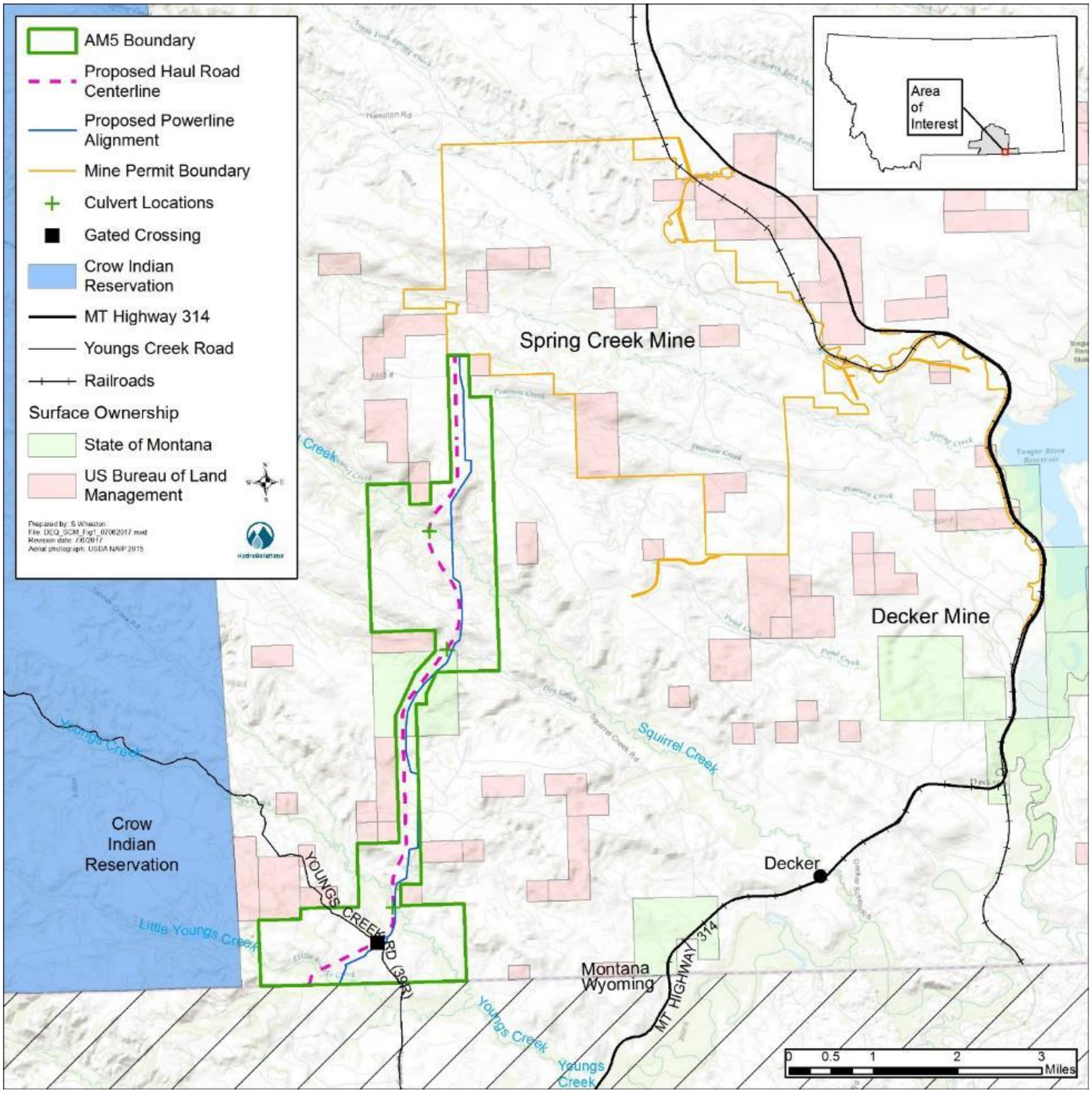


Figure 1.3-1. Project location for the AM5 Amendment Application.

1.4 Scope of the Document

The geographic scope of this EIS covers the lands within the AM5 boundary as well as lands outside of this boundary that may be affected by an alternative being analyzed. The EIS will only disclose potential impacts within the state of Montana as required by MEPA; the EIS cannot examine potential impacts in Wyoming. Three alternatives are described and evaluated in detail in this EIS. Chapter 2 describes the No Action Alternative, the Proposed Action, and the Agency Modified Alternative. Chapter 3 describes the existing environment and environmental consequences to the resource areas from implementation of the alternatives. Resource areas discussed in detail include: geology and minerals, soils, vegetation and reclamation, surface and groundwater, land use, visuals, noise, cultural resources, socioeconomics, and wildlife. Chapter 4 describes the cumulative, unavoidable, irreversible, irretrievable, and secondary impacts that may occur under the alternatives. Chapter 5 provides a comparison of alternatives, Chapter 6 documents agency consultation and coordination, and Chapter 7 lists the preparers. Chapter 8 contains the glossary and acronym list and Chapter 9 lists the references cited in the EIS.

1.5 Agency Roles and Responsibilities

DEQ is responsible for administrating the Montana Strip and Underground Mine Reclamation Act (MSUMRA) and the rules and regulations therein. MSUMRA prescribes the permitting and amendment process for coal mines in Montana. AM5 is being reviewed as part of this process. MSUMRA requires review of each application in three stages: completeness, acceptability, and decision.

1.5.1 MSUMRA Process

An application is considered administratively complete if it contains information addressing application requirements in 82-4-222 (revisions to a permit) and 82-4-231 (reclamation plan), MCA, and the rules implementing that section and all information necessary to initiate processing and public review. Once an application is found to be complete, DEQ reviews the materials submitted for any deficiencies corresponding to requirements under Administrative Rules of the State of Montana (ARM) Title 17 Chapter 24, Subchapters 3 through 13. Deficiency notices are submitted to the proponent and specify what information is missing or incomplete. An application is considered acceptable once all deficiencies have been addressed. DEQ determines the appropriate level of environmental review under MEPA, either an Environmental Assessment (EA) or an EIS, as another part of the process after the MSUMRA permit application is found to be complete. An EIS is required where DEQ determines that the application involves a major action significantly affecting the environment. § 75-201-(1)(b)(iv), MCA. ARM 17.4.617(9) permits DEQ to include in an EIS an identification of the agency’s preferred alternative, if any, and the reasons for the preference. Once that application is determined acceptable and the environmental review is completed, DEQ issues written findings as part of a decision document. MSUMRA requires mine operators to "locate and operate haul and access roads to avoid or minimize impacts to important fish and wildlife species or other species protected by state or federal law." ARM 17.24.751(2)(b).

1.5.2 Spring Creek Mine: AM5 Process

On December 30, 2015, DEQ received an amendment application (AM5) for Surface Mining Permit C1979012 from SCM. DEQ found the application to be administratively complete on August 2, 2016. DEQ completed the first acceptability review and provided a deficiency letter to SCM on November 29, 2016. SCM responded to the deficiency review on March 16, 2017. In the subsequent review, per ARM 17.24.404, DEQ determined that SCM had made a significant modification to the application by adding a high voltage distribution line along the entire length of the proposed transportation corridor. When a significant change to the application has occurred, DEQ is required to conduct a new review, including an administrative completeness determination. DEQ determined that the revised application for AM5 was administratively complete on March 21, 2017. DEQ reaffirmed that an EIS was necessary for the application.

1.5.3 Other Agency Roles: Greater Sage-Grouse Habitat Conservation Program

In response to Senate Bill 261 and Executive Orders 10-2014, 12-2015, and 21-2015 (which updated the map provided in EO 12-2015) many DEQ permits and approvals in greater sage-grouse (*Centrocercus urophasianus*) core, general, or connectivity habitat, received on or after January 1, 2016, must include a consultation letter from the Sage Grouse Habitat Conservation Program. The Montana Sage Grouse Oversight Team (MSGOT) provides guidance to the Sage Grouse Program and makes decisions regarding implementation of the Executive Orders. The AM5 area includes both greater sage-grouse core and general habitat areas (MFWP 2015); no connectivity areas are present in the proposed project area. During the course of identifying the route and planning for the new the road corridor, CPE determined that the project would deviate from certain Core Area and General Habitat stipulation requirements set forth in Executive Order 12-2015. Facets of the proposed permit amendment identified by SCM as not complying with Executive Order 12-2015 requirements include:

- The haul road is a new activity of a long duration in two greater sage-grouse core areas;
- New disturbance is expected to exceed the 5% threshold cap within the Density Disturbance Calculation Tool analysis area;
- Noise during construction and reclamation would exceed allowable thresholds during the breeding season at several lek locations;
- Lek buffers (0.6 mile no-surface-occupancy (NSO), and 2.0 mile transportation) for active sage-grouse leks would be traversed; and

- Activity would occur within the seasonal use restriction periods of breeding, nesting, and brood rearing (MSGOT 2016).

Executive Order 12-2015 provides guidance that MSUMRA is the mechanism by which Montana Sage Grouse Conservation Strategy should be applied to coal mining operations. Through the EIS and permitting process, DEQ is required to consider alternatives and impacts to greater sage-grouse, among other resources. Stipulations and thresholds outlined in Executive Order 12-2015 are still applicable, but should be considered through DEQ's EIS and permitting process under MSUMRA.

Executive Order 12-2015 states that all new land uses or activities subject to State agency review, approval, or authorization shall follow the sequencing approach of avoid, minimize, reclaim, and compensate, as appropriate (page 4, Section G, 13). That section further states that "mitigation shall be required even if the adverse impacts to greater sage-grouse are indirect or temporary," and describes a variety of mitigation tools with which to meet that requirement. Section N, 15 (page 8) clarifies that these requirements also apply to new activities associated with existing land uses in place prior to the effective date of the EO, as is the case for the proposed AM5 haul road project. As noted, mitigation for sensitive species such as greater sage-grouse is also required by MSUMRA.

The Sage Grouse Program, DEQ, and SCM collaborated on a mitigation plan (**Appendix B**) to address the areas of concern outlined above. The mitigation plan describes actions outlined in the DEQ AMA, voluntary actions that SCM has implemented or has committed to implementing, and a compensatory mitigation strategy. SCM has included actions to avoid, minimize, and reclaim impacts to greater sage-grouse. The MSGOT approved the mitigation plan at its April 26, 2018 meeting. More detail on the compensatory mitigation is provided in Section 2.4.

Thunder Basin Grasslands Prairie Ecosystem Association

CPE is a member of the Thunder Basin Grasslands Prairie Ecosystem Association (Association). Membership is open to private, State, and Federal property owners and other interested parties located within the main block of the Coverage Area (TBGPEA 2017). Current members include energy (coal, oil and gas) producers, private landowners and individuals, and non-governmental organizations.

The Association has developed a Conservation Strategy (Strategy) in cooperation with the U.S. Fish and Wildlife Service (USFWS) that is currently being implemented and will continue voluntarily through a Candidate Conservation Agreement with Assurances, Candidate Conservation Agreement, and Conservation Agreement (Agreements), depending on whether or not current or future interests in federal property (surface or mineral) exist. This voluntary strategy encompasses approximately

13.2 million largely contiguous acres spanning northeastern Wyoming and southeastern Montana, including the SCM and AM5 areas, and addresses eight covered vertebrate species in two primary ecosystems (TBGPEA 2017).

Under the Association's approved framework, participating members engage in voluntary conservation efforts and receive regulatory assurances or a high degree of certainty through the Agreements that, if the greater sage-grouse or any other covered species were listed under the federal Endangered Species Act in the future, the members' activities could continue under a specified take permit that would be issued by the USFWS to the Association. The Strategy is based on the idea that if enough of the participating Association members implement conservation measures, the likelihood that any of the covered species, including greater sage-grouse, will be listed will be reduced and no additional conservation measures will be required of the participating members. The Association's Agreements with the USFWS have an initial term of 30 years, with an opportunity for renewal (TBGPEA 2017). Any permits issued following a federal listing action also would have a 30-year term.

The Association's Strategy provides a broad array or "menu" of more than 175 conservation measures for participating members to choose from to implement in exchange for regulatory assurances or certainties. The conservation measures were developed collaboratively with, and endorsed by, the USFWS, Bureau of Land Management (BLM), USDA Forest Service (USFS), state agencies, environmental groups, and regional experts. The conservation measures are categorical (i.e., based on the targeted species and/or ecosystem), and can be applied either on-site or off-property, depending on where the greatest benefit will occur. As a member, CPE could select conservation measures from the menu to address impacts to covered species and then seek approval from the Association's Board of Directors that the selected measure(s) fulfill(s) the requirements of the Strategy and Agreements.

As indicated, participation under the Association's Strategy must be voluntary in order to qualify for regulatory assurances or certainties under the USFWS Agreements. Therefore, participation in the Strategy and its corresponding Agreements cannot be required or relied upon to fulfill any state or federal agency regulatory permitting requirements. However, per the USFWS individual conservation measures can be used to meet both purposes (Abbott 2016). The same conservation measure(s) can be implemented under the Association's Strategy and required as part of state or federal permitting actions, as long as participation in the Strategy itself is not a required component of that permitting action.

Certificate of Inclusion and Certificate of Participation

After approval of its selected conservation measures, the Association's Board issued SCM a combined Certificate of Inclusion and Certificate of Participation (CI/CP) due to its mix of private and federal interest property (TGPEA 2017). The CI/CP details SCM's conservation measures selected to eliminate or minimize threats to greater sage-grouse and other covered species, or to enhance, restore, or maintain habitat to provide a net conservation benefit for one or more of the covered species. In addition, each holder of a CI/CP is authorized to engage in any otherwise lawful activities (i.e., covered activities) on properties enrolled in the Strategy that may result in the incidental taking of the covered species, should they become federally listed in the future, subject to the terms and conditions of the Strategy and associated take permit, as applicable. As with the Strategy and supporting permit, the initial term of the CI/CP is 30 years with an option to renew.

Conservation Priorities and Contingencies

SCM's CI/CP identifies the following conservation priorities and corresponding committed and contingency conservation measures selected for the 29,880 acres of the Arrowhead I LLC lands in support of the Strategy (TGPEA 2017). Some lands are internal to the Arrowhead I boundary, but are excluded from the enrolled lands subject to the SCM CI/CP with the Thunder Basin Association because they are managed by the State of Montana or a federal agency such as the BLM. The CI/CP enrolled lands that fall within the AM5 boundary encompass 3,381 of the 4,334 acres covered by the AM5 permit amendment. One or more of these same measures also could be identified by DEQ for mitigation actions as a part of the AM5 permitting requirements. Conservation measure identifiers are included as a cross-reference to the CI/CP documents.

- **Priority 1: Habitat Preservation** – Establish two separate conservation easements, totaling 700 acres (330 & 370 contiguous acres each), located within greater sage-grouse core areas. The easements will be managed for the benefit of sagebrush steppe species and would be in place for a minimum of 30 years, which corresponds to the initial duration of the CI/CP (Conservation Measure A10a).
- **Priority 2: Invasive Species** – This priority comprises two parts (a) complete focused conifer (ponderosa pine and Rocky Mountain juniper) removal on up to 8,823 non-contiguous acres within greater sage-grouse core areas and/or in close proximity to active greater sage-grouse leks (A16c); and (b) treat up to 80 collective acres of habitat impacted by wildfire with herbicide and reseed with native species, as needed, should wildfire impacts occur (A22b).
- **Priority 3: Enhanced Water and Green Area Availability** – This priority comprises five parts:
    - Commitments to (a) place grazing exclosures at three green area sites (wet meadows, springs, or seeps) using wildlife ingress-egress fencing designs

(A18a), (b) install water guzzlers in up to three locations (E2a), and (c) install wildlife escape ramps in seven stock tanks (E2b).
    - Contingency plans to (d) construct two spreader dikes in ephemeral draws with intermittent wet meadows to increase greater sage-grouse brood rearing (green area) habitat, and (e) install four structures to stabilize head cut erosion features and therefore improving greater sage-grouse brood rearing habitat.
- **Priority 4: Habitat Improvements and Enhancements** –In an effort to reduce collisions by greater sage-grouse, (a) one mile of unused fence will be removed, including a stretch immediately adjacent to an active greater sage-grouse lek and all remaining fence within 0.6 mile of an active greater sage-grouse lek will be marked (A9a, A9b), and (b) two road sections will be removed and reclaimed (A20a).
- **Priority 5: Mandatory Rodenticide Restrictions**

The following are additional Contingency Conservation Measures that may be used as replacements for Implemented measures discussed above if issues arise and the Association approves of the substitutions, or for other purposes such as fulfilling any future mitigation obligations.

- **West Nile Virus (WNv)** – In an effort to reduce the potential for WNv, (a) eight bat houses will be constructed and established at mesic locations to encourage bat predation on mosquitoes (C2a), and (b) seven active stock tanks will be treated with larvicide during the mosquito breeding season (C1d).
- **Advocating Practices that Reduce Habitats for Predators of Sage Grouse** – SCM will provide education programs for small acreage landowners regarding benefits and detriments of management approaches relative to grouse predators (C3a).
- **Stabilize Head Cuts**- Reduce sedimentation by stabilizing head cuts on ephemeral draws in suitable sagebrush steppe habitat. Sites identified are in a tributary of Squirrel Creek (E1).

Prior to and throughout the EIS process, DEQ and SCM have briefed MSGOT on the Proposed Action, alternatives development, and potential mitigation options. This process involves MSGOT's use of the Association's Strategy to identify specific conservation measures that would be required of SCM and included as stipulations to any permits issued by DEQ. Upon issuance of the Draft EIS, MSGOT will review the preferred alternative and site-specific mitigation requirements identified for the AM5 transportation corridor project. If MSGOT concurs, these site-specific mitigation measures would become requirements in the final DEQ permit (MSGOT 2016).

1.5 Public Participation

MEPA provides for public review and comment on EISs at the initiation of a project during scoping and once the environmental analysis is made available in the draft document. The purpose of scoping is to gather input from the public, other agencies, and organizations on the issues of concern and potential alternatives that would meet the purpose and need for a project. The scoping period for the Spring Creek Mine EIS began on April 13, 2017 and ended on May 15, 2017. DEQ held a public scoping meeting in Hardin, Montana on April 27 and provided a court reporter for transcribing oral comments. DEQ also accepted written comments at the meeting and via email or postal mail. DEQ published legal notice of the scoping period and meeting in the Big Horn County News on April 13th and 20th. The transcript of the meeting is included in the Administrative Record for the project.

1.6.1 Scoping Comments

DEQ received five comments during the scoping period; three from nearby landowners, one from the Northern Cheyenne Tribe, and one from the Montana Historical Society. The main concerns raised related to livestock movement and water access from one side of the road to the other during operation, how the corridor would be fenced, continued access to nearby Bureau of Land Management lands for hunting, and methods of weed control to be used. One commenter questioned SCM's authorization to access lands near the AM5 area, (T9S, R39E, S 29, NE ¼, NW ¼ and NW ¼, NE ¼; and S 20 SW ¼, SE ¼); however, these lands are outside of the proposed AM5 permit amendment area, so no access is necessary. The commenter also requested that additional studies be conducted on these lands, but since they are outside of the permit area and removed from the proposed alignment, DEQ does not have the authority to require SCM to include these lands in their study or monitoring plans. The Northern Cheyenne Tribe requested to be notified of meetings on AM5 and to receive a copy of the Draft EIS. The Montana Historical Society requested some additional information on the impact area, and concurred on the findings from SCM's cultural resource studies (Wilmoth 2017).

1.6.2 Public Comment Period

The public will have additional opportunities to participate in this environmental review process. Members of the public may submit comments on the draft EIS during a comment period. DEQ will hold a public meeting during the comment period for the draft EIS. DEQ will review the comments received and respond to all substantive comments in the final EIS. Some responses may require changes to be made in the draft EIS.

1.7 Issues of Concern

The primary issues of concern related to the Proposed Action include:

- Compliance with Executive Orders 12-2015 and 21-2015 related to greater sage-grouse
- Livestock management
- Noise and potential impacts on wildlife
- Wildlife movement impacts
- Public safety at the Big Horn County Road 39R (Youngs Creek Road) Crossing
- Stream crossing design
- Water quality and erosion
- Cultural resources impacts during construction

Chapter 2 : Description of Alternatives

This chapter describes the process of developing and selecting reasonable alternatives to the Proposed Action. This chapter also includes a description and maps of the alternatives considered, activities common to all alternatives, a comparison of these alternatives focusing on the issues of concern, and design elements associated with alternatives. The comparison of alternatives provides a basis for choice among the options for the decision-maker.

2.1 Development of Alternatives

To be considered for further analysis, each potential alternative had to meet the purpose and benefits of allowing SCM to pursue amending their current Surface Mining Permit, as well as regulatory, environmental, and economic feasibility criteria. In addition, each alternative must be deemed to be reasonable. A reasonable alternative is one that is practical, technically possible, and economically feasible. Economic feasibility as defined in MEPA is determined solely by the economic viability for "similar projects having similar conditions and physical locations determined without regard to the economic strength of the specific project sponsor" (75-1-201, (1)(b)(iv)(C)(I), MCA). "Alternatives" include design parameters, mitigation, or controls other than those incorporated into a proposed action by an applicant or by DEQ prior to preparation of an EA or draft EIS. ARM 17.4.603(2)(a)(ii).

MEPA requires the analysis of the Proposed Action, reasonable alternatives to the Proposed Action, and the No Action alternative. During the course of the environmental analysis, DEQ considered and dismissed several alternatives that either had greater impacts to the human environment than the Proposed Action, would not meet the purpose and need, or do not meet the criteria for reasonableness. These alternatives are summarized briefly in Section 2.6, Alternatives Considered but Dismissed.

To facilitate comparison of alternatives, this document includes background information on Montana's applicable mining laws and rules and regulations to provide context on how the state permits mining related activities (as well as other required permits and environmental standards with which SCM must comply). This review is not exhaustive; rather it provides an overview of the most pertinent regulations. The MSUMRA is contained in Section 82-4-201, *et seq*., MCA, the MEPA is contained in 75-1-100 *et seq*., MCA; the Montana Water Quality Act is contained in 75-5-101 *et seq*., MCA; Montana's non-degradation policy is found in 75-5-303, MCA; and the Clean Air Act of Montana is contained in 75-2-100 *et seq*., MCA. All regulations and environmental protections aspects required under MSUMRA and the above described laws would occur under either action alternative.

A description of the alternatives considered in detail follows, and information on those alternatives which were considered but dismissed is provided in Section 2.6. A condensed description of the potential impacts for each alternative is provided in **Tables 5.1-1, 5.1-2, and 5.1-3** at the end of this document. The detailed analysis and description of potential impacts from the alternatives relevant to each resource area are provided in Chapters 3 and 4.

2.2 No Action Alternative

MEPA requires an analysis of the No Action Alternative for all environmental reviews that include an alternative analysis. The No Action Alternative provides a comparison of environmental conditions without the proposal and establishes a baseline for evaluating the Proposed Action and the other alternatives. MEPA requires the consideration of the No Action Alternative, even if it fails to meet the purpose and need or would not be able to satisfy environmental permitting standards.

Under the No Action Alternative the AM5 amendment area would not be added to SCM's Surface Mining Permit. SCM would continue to operate the mine and process coal produced within their current permit area. At an average production rate of approximately 18 million tons per year from coal mined at SCM, the mine life is expected to last until approximately 2022. It is possible that coal from other mines could continue to be processed at SCM beyond 2022, and future leases, if granted, may extend the anticipated life of mine.

2.2.1 Permit Boundary and Disturbed Area Description

The existing permit boundary for SCM is displayed on **Figure 1.3-1**. Under the No Action Alternative, no areas would be disturbed outside of the current permit area. SCM would not pursue the additional permit area as an amendment to their existing Surface Mine Permit.

2.2.2 Mine Facilities and Personnel

Under the No Action Alternative, SCM would continue to operate existing mine facilities. Employment levels would be expected to remain the same and operations would continue until exhausted. The mine life and reserve would not be extended by the addition of YCM reserves.

2.2.2 Reclamation and Revegetation

Under the No Action Alternative, SCM would follow the same reclamation plan outlined in their current Surface Mine Permit. No areas would be disturbed outside of the existing permit boundary; therefore, no additional reclamation planning or actions would be necessary.

2.2.3 Thunder Basin Agreement Mitigations

As described in Section 1.5.3 Other Agency Roles, as a member of the Thunder Basin Grasslands Prairie Ecosystem Association, CPE has developed a voluntary conservation effort summarized in its CI/CP. The area covered by this CI/CP is much larger than the AM5 permit area, and fully encompasses the AM5 permit area. Some lands are internal to the Arrowhead I boundary, but are excluded from the enrolled lands subject to the SCM CI/CP with the Thunder Basin Association because they are managed by the State of Montana or a federal agency such as the BLM. The CI/CP has been finalized and signed; therefore, CPE's commitments under the CI/CP would occur independent of DEQ's decision on the Proposed Action. The bulk of the mitigations would occur outside of the AM5 permit area and the number and acres covered by each type of action described in Section 1.5.3 are summarized in **Table 2.2-1**, below. These measures are mapped in the CI/CP Attachment 3, Planned Conservation Measures (TGPEA 2017). Commitments that are not quantitative include post-wildfire weed suppression treatments (A22b). These would occur as needed and only on affected areas. SCM has also agreed to forego the use of anticoagulant rodenticides (E2b).

Table 2.2-1. Summary of Conservation Measures within the Arrowhead I area and within the AM5 Permit area as Stipulated under the Thunder Basin CI/CP. Contingency measures are in italics.

Measure ID	Conservation Measure	Arrowhead I Area: Count	Units	Within AM5 Count	Units
A17c	*Green Area Development Site*	*3*	*points*	*0*	*points*
A18c	Green Area Protection Site	3	points	0	points
C1d	*Larvae Treatment Site*	*7*	*points*	*1*	*points*
C2a	*Bat House Installation*	*8*	*points*	*0*	*points*
E1	*Headcut Stabilizations*	*4*	*sites*	*0*	*sites*
E2b	Stock Tank Ramp	6	points	1	points
E2a	Wildlife Guzzler	3	points	0	points
A9a, A9b	Fence Removal[1]	2.59	miles	0	miles
	Overhead Powerline	91.88	miles	5.22	miles
A20a	Road Closure	0.62	miles	0	miles
A16c	Conifer Removal	8,823.21	acres	828.47	acres
A10a	Conservation Easement	689.19	acres	0	acres
	Total area in AHI CCA CCAA Boundary	24,716.51	acres	3,381.23	acres

Source: TBGPEA 2017

Additional fence removals, fence marking (A9b), larvicide treatments for mosquito control, bat house installations, headcut stabilizations, and presentations to local landowners on predators (C3e) have been identified as contingency conservation measures in the CI/CP.

2.3 Proposed Action Alternative (AM5)

SCM has submitted an amendment application for Surface Mining Permit C1979012. This amendment application, referred to as AM5, is for a haul road, contained entirely within Montana, which would extend the permit boundary of the SCM to the State of Montana line. This proposed haul road would allow for connecting SCM with YCM. The addition of the proposed haul road would allow SCM to extend the life of the mine to 2030 with reclamation completed by 2034. SCM has proposed a haul road and associated high voltage distribution line as the Proposed Action for the transportation corridor. As previously stated, the haul road would primarily be used to transport coal from a currently permitted mine, YCM, in Wyoming to the processing facility at SCM where the coal would be processed and then transported off site under the existing SCM permit. The AM5 area is not an expansion of the area to be mined.

2.3.1 Permit Boundary and Disturbed Areas Description

The proposed AM5 area encompasses approximately 4,334 acres south of the existing mine permit boundary **(Figure 2.3-1**). AM5 begins at the southern boundary of the existing SCM permit in the southwest ¼ of Section 27, T8S, R 39E near the headwaters of Pearson Creek. The amendment area proceeds south through the west ½ of Section 34, traverses into T9S, R39E at Section 3 and 4 where it crosses Squirrel Creek, then moves through Sections 9 and 10 across Dry Creek. The amendment area then crosses through State Trust land Section 16 via a Commercial Lease. AM5 then traverses Section 21, 28, and 29, to the east of Youngs Creek. The amendment area then encompasses Section 32, 33, and a portion of Section 1 in T10 S R38E on the southern end of the project. In this area the road alignment crosses Youngs Creek in Section 33, and then turns westward into Section 32 where it crosses Little Youngs Creek just north of the Montana border.

The area to be disturbed includes the following project components: the road alignment, a high voltage distribution line, soil stockpiles, sediment and settling ponds, other sediment control features, culverts, fences, and appropriate safety features. SCM estimates that of the 4,334 acres within the AM5 area, approximately 970 acres will be disturbed to complete the roadway and associated features (**Table 2.3-1**). Approximately 303 acres of the disturbed area would constitute the roadway footprint and would be actively used during the life of the project.

Table 2.3-1. Estimates of Total Disturbed Area, in Acres, for the Action Alternatives		
	Proposed Action	**Agency Modified Alternative**
AM5 Permit Area (acres)	4,334	4,334
Total Disturbed Area (acres)	969.7	962.4
Transport Route Length (miles)	8.45	8.45
Average Width (feet)	296.1	296.1
Roadway Footprint (acres)	303.3	303.3
Total cut and fill ($yards^3$)	6.5 million	6.5 million
Ponds (acres)	9.46	9.46
Soil Stockpiles (acres)	96.63	96.63
Wetlands Impacted[1] (acres)	14	14
Riparian Area Impacted[1] (acres)	12	12
Sage Grouse Core Area[2] Disturbed (acres)	441	441
Sage Grouse General Habitat[2] Disturbed (acres)	521.5	521.5
Area Leased for Grazing (acres)	4,141	4,141

Sources: Ackerman 2017f; 2017i; 2017j

[1]From 17.24.313 SCM Reclamation Plan

[2] As delineated in shapefiles available from Montana FWP (2015)

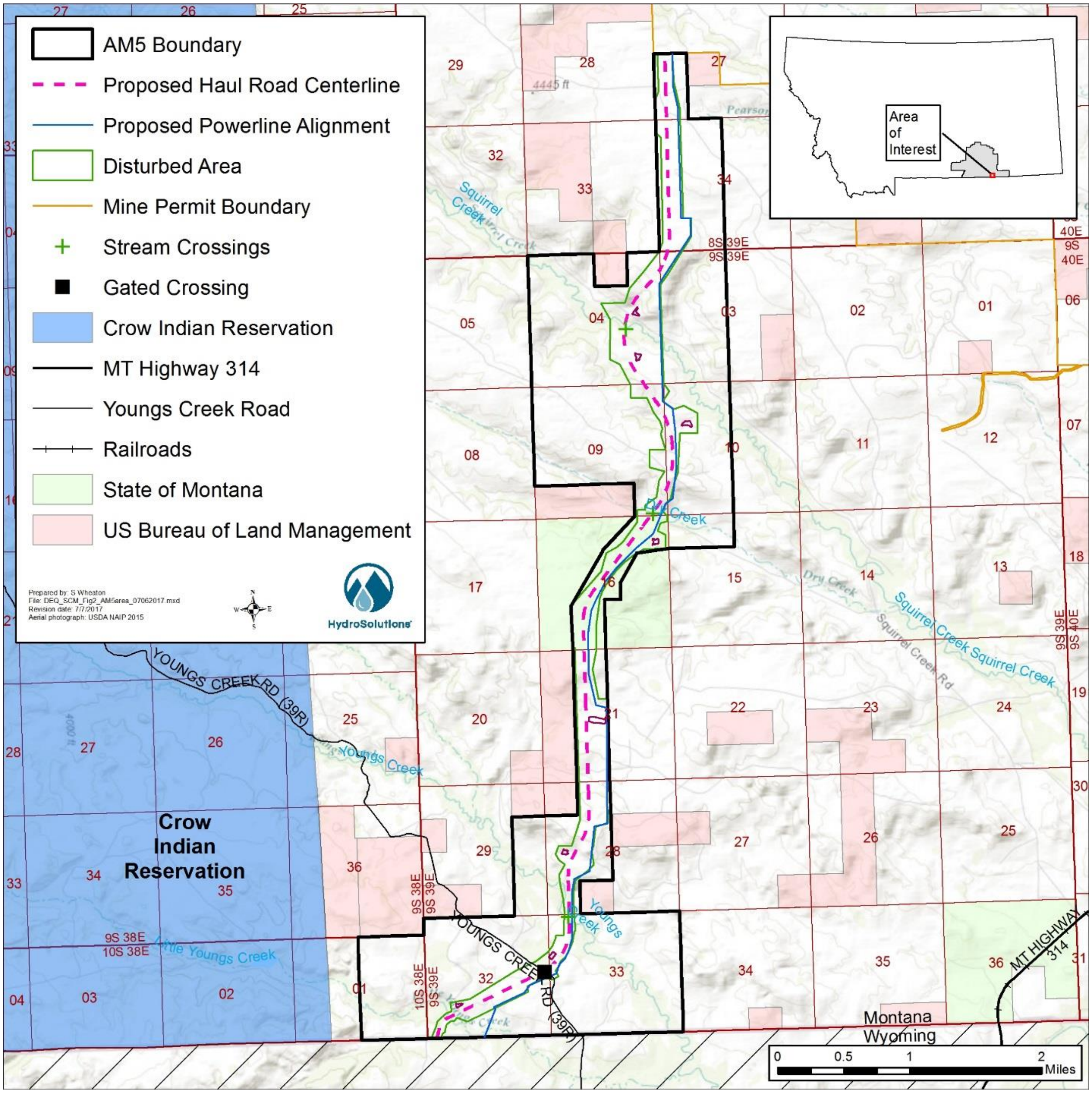


Figure 2.3-1. Location of the AM5 permit area.

2.3.2 Mine Facilities and Personnel

SCM extracts thermal coal from the Anderson-Dietz seam, which averages approximately 80 feet in thickness in the permit area. SCM shipped approximately 10.3 million tons in 2016. Coal mined from SCM is shipped primarily to electric utilities and industrial customers in the northwest, midwest, northeast, and southwest United States, various Canadian provinces, and exported to Asian utility customers via the Westshore terminal in British Columbia, Canada.

The mine permit area currently covers approximately 13,460 acres. The life of the mine under its most recent permit is estimated at 18 years with mining operations expected to conclude by 2030 and reclamation to be completed by 2034. The anticipated annual production from the entire SCM property ranges from 10 million tons to 30 million tons. If AM5 is approved, this range would include coal tonnage brought to SCM from other properties via the AM5 haul road, which in turn would extend the life of SCM.

2.3.2.1 Processing Facilities

The processing facilities are already built and permitted under SCM's current mine permit. Coal processing, temporary storage, and railcar loading occurs within the current SCM permit area (**Figure 1.3-1**). The coal processing system, which includes crushing, handling and storage of the sized coal product, was completed in late 1980. The only processing performed on coal is sizing to a nominal product size. No cleaning takes place during the processing.

2.3.2.2 Personnel

SCM employed approximately 240 people in 2017 (Ackerman 2017c). They anticipate that most of the road construction work would be completed by existing staff using SCM trucks and equipment. SCM anticipates that 10-15 new temporary jobs would be created during road construction (Ackerman 2017e).

2.3.3 Proposed Road Alignment

The proposed haul road alignment would be contained within the AM5 boundary. **Figure 2.3-1** shows the proposed centerline and associated structures and features.

The proposed alignment crosses some light use ranch roads and the Youngs Creek County Road (39R). The latter crossing would be controlled with a gate system when mine traffic crosses the intersection. Crossing frequency is estimated to be four haul trucks per hour plus associated light-duty traffic (Ackerman 2017h).

2.3.4 Haul Road Design and Construction

The road alignment would be approximately nine miles long and would have a driving width of 120 feet. The largest vehicles anticipated to be used on the road would be 240-ton class haul trucks that require a 12-foot high by 25-foot wide safety berm (See Section 2.3.6 below). An above-ground 34.5 kilovolt (kV) high voltage distribution line would roughly parallel the road alignment to the east (See Section 2.3.5).

SCM proposes to use their own mine equipment and operators to do much of the cut and fill required to develop the haul road but fencing, surveying, and stream crossing construction may be contracted out (Ackerman 2017j). SCM anticipates that construction would take between one and two years to complete, depending on weather conditions, permitting time, and contractor availability. The road design specifics would be finalized once a preferred route is selected, but it is anticipated that much of the roadway would require minimal cut and fill. SCM anticipates that approximately 6.5 million cubic yards of cut and fill would be necessary over the nine-mile alignment (Ackerman 2017f). To accommodate the 2:1 allowable slope (approximately a 27 degree angle) for construction equipment to operate on the berms safely, the width of the base of the road structure will vary from 250 to 800 feet wide. Average width of the road base would be approximately 296 feet. The total acreage disturbed or encompassed by the road bed would be approximately 303 acres (**Table 2.3-1**). The road earthwork was designed to allow for a balance between cut and total fill needed. Therefore, all fill would be sourced locally.

SCM would develop the roadway following a process similar to the initial stages of mine pit advancement. Construction would proceed from either or both the north or south terminus. SCM has committed in their existing mine permit to no new disturbance between April 1 thru July 31 for ground nesting species protection (Detmer 2017).

Components of the construction such as stream crossings may require access via existing CPE ranch roads to utilize the most direct route. Some areas may require blasting to remove competent bedrock to meet the grade required for safe hauling. The road will be constructed by cutting and filling overburden to the grades and lines required for safe hauling by using the mine equipment fleet available at SCM or by a contractor. Topsoil material as identified for salvage along the haul road and all other disturbed areas prior to initial construction will be stockpiled. The mine has existing stockpile areas and well-established practices for removing and storing topsoil and overburden to facilitate construction and future reclamation. New stockpile areas would be established along the roadway as needed to minimize material transport and retain local soil characteristics.

SCM would delineate the haul road centerline on the ground and establish sediment and erosion control structures at each drainage crossing and along the area of disturbance (See Section 2.3.7). Construction would include culverted fill crossings of Squirrel, Dry, Youngs, and Little Youngs Creeks. The soils in the area are fine and the generally arid climate would likely require consistent dust control as well as preventative sediment control. General soil salvage operations within the corridor would be conducted in accordance with ARM 17.24.313(1)(g) which addresses maintaining soil profiles and type distribution consistent with pre-disturbance mapping. At the first seasonal opportunity with consideration of potential winter site conditions, SCM will revegetate or otherwise stabilize all cut and fill slopes resulting from construction of the haul road. Cut and fill slopes constructed of all scoria (i.e., clinker) would not be vegetated because of the inherent stability, durability, and resistance to erosion of this material. When possible, vegetation removal in greater sage-grouse Core Areas would occur between July 16 and March 14.

SCM will construct drainage ditches on both sides of the haul roads, or ancillary roads, and on the inside shoulder of a cut fill section. The company will line some of the side slopes of haul roads with 2 to 4 inches of 2-inch minus scoria for sediment control, wherever the runoff from the haul road intercepts any drainage ditch carrying undisturbed runoff. Ditch-type cross drains will be spaced as needed according to grade, so that water can be intercepted before reaching a switchback or scoria would be used to top the road surface to allow for drainage and provide a more durable surface. Some materials, such as fencing and culvert sections, may be transported on existing ranch roads and delivered closer to where they would be used.

2.3.4.1 Water Pipeline
It is possible that a buried water pipeline would be developed to supply water for dust suppression and other incidental uses along the corridor. The pipeline would be buried along the edge of the road alignment and fill stations would be set up at intervals along the route to allow dust suppression trucks to resupply.

2.3.4.2 Fencing
Grazing leases exist on the lands crossed by the AM5 alignment. A fence would be established around the disturbed area to prevent livestock from moving across the roadway. Whenever possible, the fenceline would be placed close to the edge of the road base, but topography and the few existing roads may necessitate some deviations (Ackerman 2017f). SCM estimates that the fence will be approximately 18.8 to 20.7 miles long, allowing for topography. The fenceline would funnel livestock to the four culverts that would carry streamflow from each of the waterways intersected. The fence would be designed with four wires, one smooth bottom wire at about 18-inches above ground and three additional barb wire strands (located at roughly 18”, 28”, and 42”)(Ackerman 2017j). This would allow pronghorn (*Antilocapra americana*) to pass under the bottom wire without snagging.

2.3.5 High Voltage Distribution Line
In order to consolidate disturbance and minimize impacts to wildlife, a 34.5 kV high voltage distribution line would be constructed within the AM5 transportation corridor to supply power to CPE’s Youngs Creek Mine in Wyoming. The route of this line is depicted on **Figure 2.3-1.** The length of this high voltage distribution line would be approximately nine miles with a single pole design. The high voltage distribution line is designed with one ground wire, three conductors, and one fiber optic line for five lines total. The pole height above ground level will vary between 60-65 feet with the average

distance between the poles varying between 300-350 feet for a total between 130 and 160 poles. Lighting will occur at strategically located areas along the haul road for heightened visibility (Ackerman 2017l). All high voltage distribution line and substation construction will be in accordance with ARM 17.24.751(2)(a) and 17.24.312, which require that the high voltage distribution line and other transmission facilities be constructed to meet the current Avian Power Line Interaction Committee (APLIC) guidelines to reduce the potential for electrocution, collision mortality, and injury (Ackerman 2017a).

2.3.6 Coal Transport and Hauling Operations

SCM proposes to transport coal along the roadway using the same 240-ton class haul trucks it operates within the mine, currently Komatsu 830E AC drive trucks. These trucks are approximately 22 feet tall and 24 feet wide and have a total empty vehicle weight of 362,000 pounds (Komatsu 2009). As a comparison, a standard pickup truck is approximately 6 feet tall and 6.5 feet wide and weighs between 6,000 and 10,000 pounds depending on the model.

The Komatsu trucks have a maximum speed of 40 mph and run on diesel fuel and an electric drive that enhances traction and braking power. The nominal payload for a Komatsu 830E AC is 488,650 pounds (Komatsu 2009). SCM has six Komatsu 830E AC trucks that would be tasked with daily hauling. SCM estimates that a haul truck would cover the 18-mile round-trip in 97 minutes averaging 16 mph with downhill travel restricted to 10 mph (Ackerman 2017b). Support traffic would average four to five vehicles per hour during the five-day work week in daylight hours (Ackerman 2017h). Support traffic along the route would include supervisor and crew transportation, scrapers, graders, water trucks for dust control, maintenance and blasting equipment, and lube and fuel trucks (Ackerman 2017b, 2017h).

SCM employs measures to reduce noise on haul trucks, including thermostatic fan clutches to run 20-30% of typical speed, insulating blankets used on high-quality mufflers, and noise blankets used on exhaust systems (Maunder 2017).

SCM proposes to haul 24 hours a day, seven days a week, 365 days per year (Ackerman 2017g). Average daily traffic for the haul route would include four haul trucks per hour and one to two support vehicles per hour for a total of approximately 120 to 145 vehicle trips per day (**Table 2.3-2**) (Maunder 2017). This would equate to approximately one to two service vehicles and two loaded and two empty haul trucks passing a fixed point on the haul route each hour, or about one truck every 15 minutes. Haul trucks are equipped with four halogen headlights as well as braking, backup safety, and service lights. Refueling would occur as needed using mobile fuel trucks.

Table 2.3-2 Truck Traffic Estimation

Annual Production	Haul Truck Capacity (Tons)	Loads per Day	Cycle Time (mins)	Haul Truck Travel Frequency (Trucks/hour)	Total Trips per Day
5 Mtpy	280	49	97	4	96
		Other Traffic			
Vehicle Type				**Travel Frequency (Trucks/hour)**	**Trips per Day**
Pickup Trucks (supervision/ maintenance/ environmental)			NA	0.5	12-14
Van/ Crew Bus				0.16	4
Water/Fuel Trucks				0.58	14
Grader				0.16	4
			Total	1.4	34-36

Source: Maunder 2017
Mtpy = Million tons/year

Haul truck traffic is limited by the rate of mining and the equipment available to load and unload the haul trucks. Each empty haul truck must be loaded individually by the excavator at the YCM site and then unloaded at the SCM processing site. The time for the loading and unloading process essentially spreads out the trucks; it is not possible for multiple trucks to "stack up" or to increase the frequency of truck trips given the coal production rate and available equipment. SCM estimates that the four trucks per hour rate would be achieved during full production and remain consistent for the life of the AM5 corridor.

The intersection between the haul road and Youngs Creek Road would be controlled with a gate system operated by electronic sensors. SCM is proposing 24-foot wide gates on Youngs Creek Road (one on each side of the haul road) and two 55-foot wide gates on the haul road (one pair on each side of Youngs Creek Road). The default position for the gates on the haul road would be closed to block haul trucks and open on Youngs Creek Road to allow public traffic to move unimpeded. When a haul truck approaches the intersection, the gates on Youngs Creek Road would close to block public traffic and open on the haul road to allow the haul truck to pass.

2.3.7 Surface Water Resource Protection

There are five named waterways that intersect the AM5 area. Proceeding from north to south these are: Pearson Creek, Squirrel Creek, Dry Creek, Youngs Creek, and Little Youngs Creek. In addition to these named waterways, there are several tributary drainages within the AM5 boundary. The proposed haul road alignment would cross three perennial streams (Squirrel, Youngs, and Little Youngs Creeks) and one major ephemeral stream (Dry Creek). The proposed alignment would not intersect Pearson Creek. Details for each of the four proposed stream crossing culverts are provided in **Table 2.3-3. Figure 2.3-2** provides example drawings for two of the proposed stream crossings fill and culvert dimensions. The crossing at Dry Creek (See A in **Figure 2.3-2**) would be the largest, measuring over 600 feet wide at the base and rising 92 feet above the current valley bottom. The crossing at Little Youngs Creek would be the smallest constructed, with a 386-foot-wide road base and a road surface height 31 feet above the current valley bottom (See B in **Figure 2.3-2**).

Details and dimensions for the additional 27 culverts are provided in **Appendix A**. In general, these crossings will be sized to convey the peak runoff from a 100-year, 24-hour precipitation event. The crossings will also allow runoff to flow unimpeded during lower flow events to allow for passage of aquatic life. The culvert crossings are designed to be hydraulically stable under a wide range of flow conditions. Inlets and outlets will be protected from erosion and scour by use of appropriate armoring such as rock-filled gabion baskets.

The road plans call for 31 culverts to direct runoff under the roadway (SCM 2015). The culverts range in diameter from 12 inches (1 foot) to 324 inches (27 feet), with a median size of 24 inches (2 feet) **(Appendix A**). The largest culverts would be placed at the major stream crossings (**Table 2.3-3**).

The culvert crossings of Youngs Creek inside of the AM5 would have a shaped concrete channel that would concentrate low flows ensuring flowing water (when available) to minimize adverse impacts to aquatic life. Diversions would be designed and constructed in accordance with MSUMRA including, but not limited to passing flows without contributing additional suspended solids to streamflow (ARM 17.24.635), maintaining a stable longitudinal profile, safely passing the peak runoff of a 10-year, 24-hour precipitation event, retaining the channel capacity of the unmodified channel immediately up and downstream of the diversion (ARM 17.24.636), and reclaiming disturbed drainages to the pre-mining topography (ARM 17.24.651).

Table 2.3-3 Stream Crossing Details									
Site	**Approximate Alignment Milepost**	**Total Road Base Width (feet)**	**Height of Road Above Natural Ground Surface (feet)**	**Berm Outside Slope Ratio**	**Culvert Diameter (feet)**	**Culvert Length (feet)**	**Culvert Slope (%)**	**Predicted Q 100 Depth (feet)[1]**	**Estimated Water Depth Average Annual High Water [2] (feet)**
Squirrel Creek (117)	2.7	616	66	2:1	15	470	3.18	12.23	1.55
Dry Creek (121, 122)	4.3	668	92	2:1	10	608	2.08	7.30	0.96
Youngs Creek (129)[3]	7.4	451	30	2:1	27, 27	345	2.43	10.97, 9.47	0.83, 0
Little Youngs Creek (136)	8.6	386	31	2:1	22[4]	324	2.59	9.00	0.46

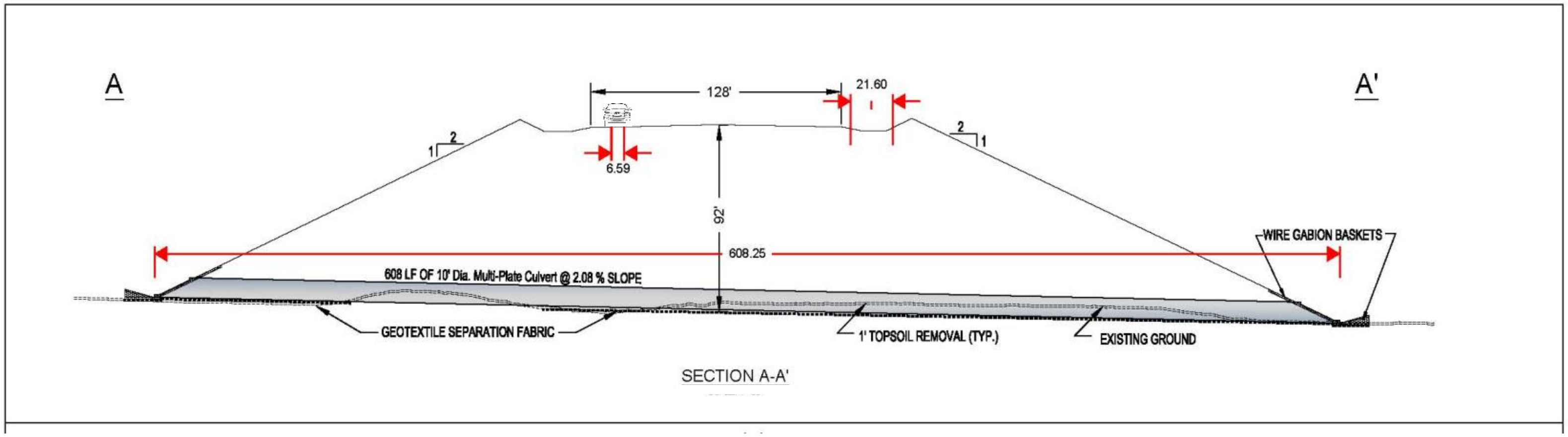
Source: Ackerman 2017d, SCM 2015 (Appendix K, Exhibit 1); and YCM 2016 (Exhibits A 1-2, A 2-2, A 3-2, and A4-2).

1 The Q100 is the flow for a flood with a one percent likelihood of occurring in any given year.

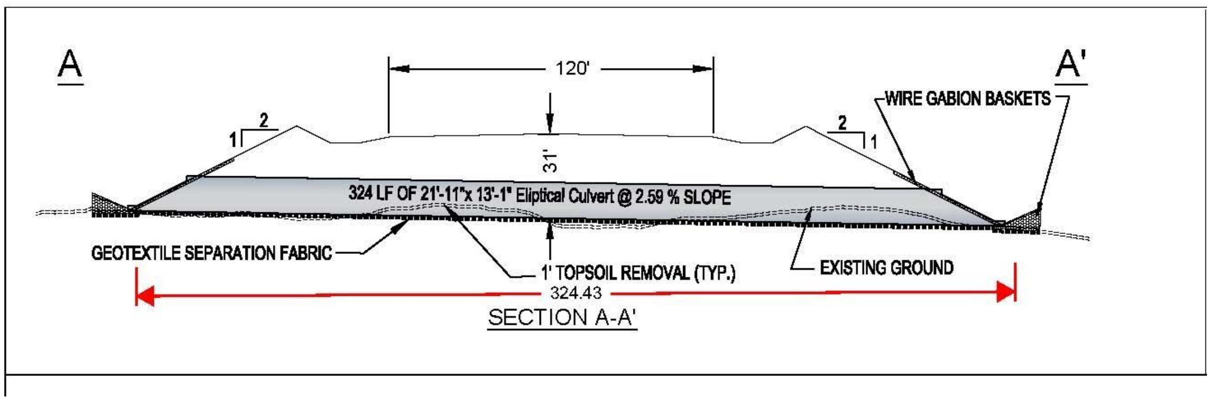
2 The average annual high water is the peak flow that would occur approximately once every 2 to 2.33 years. This flow is derived arithmetically, but is often assumed to fill the channel to bankfull height (CWCB 2008).

3 Youngs Creek would be carried by two, 27-foot wide elliptical culverts. One placed at the channel height, and one placed near bankfull height to accommodate flood flows.

4 Little Youngs Creek would be carried by a single 22-foot wide elliptical culvert.



A. Dry Creek Culvert Schematic with a standard pickup truck shown for scale.



B. Little Youngs Creek Culvert Schematic

Figure 2.3-2. Representative Creek Crossing Detail Drawings for A. Dry Creek and B. Little Youngs Creek. Drawings have been resized for this document and are not to relative scale.

Construction of the crossings would occur during the drier time of the year (e.g. late summer or fall). Equipment operation would be confined to the footprint of the disturbance across wetland, riparian, or any saturated areas. A combination of geosynthetic fabric and geogrid would be used to minimize compaction of the subsurface materials. However, since the construction project may span multiple seasons including winter, SCM would plan and manage winter site conditions to include, but not be limited to, extended shutdowns, scheduling changes, reassess new site disturbance later in the year, and the consideration of over-winter to spring thaw conditions in the selection of adequate and appropriate control measures.

The U.S. Environmental Protection Agency (EPA) Guidelines and review by DEQ- Coal and Opencut Mining Bureau and Water Protection Bureau staff have indicated that disturbed area runoff from lands affiliated with the AM5 haul road would be subject to the Montana Pollutant Discharge Elimination System (MPDES) storm water permitting program for both construction and industrial activity (EPA 2006). Two phases of permitting would be required for the AM5 actions: construction phase and transition into the long-term operating phase as part of the Spring Creek Mine Industrial Permit for Storm Water Discharges MTR000514. The storm water construction authorization for the haul road project including the crossings will remain in place until the project reaches final stabilization.

2.3.7.1 Drainage Controls During Construction

Prior to construction of the AM5 haul road, SCM would obtain coverage under the State of Montana General Permit for Storm Water Discharges Associated with Construction Activity, including filing a notice of intent (NOI) and preparation of a storm water pollution prevention plan (SWPPP). Haul road construction activities at stream and drainage crossings would meet requirements of the General Permit and the site-specific SWPPP and would generally follow the below sequence:

- Construction of the stream crossing segments would be scheduled during the driest months (August through October, if possible).
- Erosion control measures would be established at the downstream boundaries of the project areas prior to any surface disturbance.
- Topsoil (and vegetation) from the road disturbance footprint would be removed and stockpiled in accordance with section 17.24.313 of the SCM permit.
- If perennial stream flows are low enough, upstream flow would be pumped and conveyed around the project site via pipeline to reduce potential erosion impacts.
- If flows are higher than can be conveyed via pumping, a small diversion channel would be constructed around the immediate area of the affected culvert location. The channel would be constructed to be stable for base flow in the stream and

appropriate erosion protection would be installed to protect water quality for base flow such as riprap, waddles, check dams, etc.

- The small diversion ditch would be filled in and reclaimed as soon as the culvert could safely transport base flow.
- Sediment ponds would be constructed prior to road building activities. (Note that all sediment ponds do not need to be constructed at one time but only those that will receive runoff from the disturbed area).
- Alternative sediment control measures (ASCM) will be installed until permanent drainage control is installed.

SCM will file a NOI and develop a Dewatering Control Plan for any construction dewatering activities, listed in the sequence above, that discharge back into a state receiving water and require authorization under the General Permit for Construction Dewatering (CDGP). This potentially required additional CDGP authorization would further protect water quality from increased turbidity associated with pumping and discharging stream flow needed to construct the haul road. Upon installation and completion of the long-term drainage controls, the haul road corridor would be further stabilized by seeding any potential exposed slopes not constructed of scoria or bedrock.

2.3.7.2 Haul Road Drainage Controls After Construction

Following construction of the proposed haul road and final stabilization of the project in accordance with the General Permit and SWPPP requirements, SCM would file for termination of coverage under the General Permit. Concurrently, SCM would then modify their existing authorization (MTR000514) under the Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity (MSGP). As part of this action SCM would update their MSGP SWPPP and long-term drainage controls will be documented, maintained, and inspected under MTR000514.

In December 2015, SCM applied for a permit for a permanent diversion of Youngs Creek as part of the US Army Corp of Engineers (USACE) permitting process. The diversion would be developed in the SW1/4 of S28 and NW ¼ of S33, T9S, R39E. The site is outside of the sage grouse core area, but within general habitat. The diversion would be constructed in conjunction with the construction of the AM5 haul road. This diversion would be designed as USACE permanent on-site, in-kind wetland mitigation and would meet the requirements of USACE. This diversion is proposed to be located outside of the disturbance limit, but inside the AM5 permit boundary. SCM would prevent the contribution of additional suspended solids or other contaminants to enter the stream flowing through diversions. Whenever possible, diversions would be lined with vegetation for channel stability. Where design velocities indicate that vegetation will not provide sufficient protection against erosion, other means of channel stabilization would be used. Rock or straw-bale check dams or other types of sediment control measures would be employed when necessary to reduce velocities and sediment load. SCM would visually monitor the receiving channel downstream of each diversion for scour or deposition. Should scour or deposition become apparent, mitigative measures would be employed immediately.

All diversions will be designed, constructed, and maintained in compliance with the requirements and criteria of ARM 17.24.636 and ARM 17.24.637 as applicable. Collection and conveyance ditches along the proposed haul road would be sized to convey the 10-year, 24-hour storm peak discharge with a minimum of 1-foot of freeboard.

All water for construction and dust control would come from previously permitted water sources.

2.3.8 Stormwater Management

As described above, SCM would file their SWPPP with DEQ as a modification to their existing MSGP authorization. Runoff and storm water from the AM5 haul road would be managed to comply with applicable surface water quality discharge requirements. This includes use of infiltration basins to settle out suspended sediment before water is discharged offsite.

SCM currently implements best management practices (BMPs) to control sediment at the mine site and many of these practices would be adapted to control sediment along the proposed haul route. The Western Alkaline subpart stresses the continued use of these techniques to create hydrologic characteristics that are close to the premine state. According to the EPA's Western Alkaline Coal Mining Subcategory Development Document, BMPs should be planned and designed to reduce erosion within the reclaimed area. The following list of managerial BMPs was compiled in the EPA's development document:

- Minimizing the area of disturbance
- Using appropriate BMPs for site-specific conditions
- Timely placement of BMPs
- Controlling sediment at the source
- Reclaiming areas as soon as possible
- Periodic inspections, maintenance and replacement

Structural BMPs that SCM could use during and after road construction for control of sediment and erosion would include, but not be limited to: rip-rap, straw bales, contour berms, mulch, and sediment traps. MSUMRA requires runoff from disturbed areas to be treated prior to leaving the permit area by use of a BMP to prevent or minimize sediment discharge. Also, to the extent practicable, runoff from undisturbed areas would be routed around disturbed areas to prevent comingling with disturbed area runoff. To accomplish this, sedimentation ponds would be located in low spots along either side of the haul road, and water would not be discharged until it meets quality requirements. Sedimentation ponds will be inspected and maintained, in accordance with MSGP requirements, to always be in effective operating condition. When released, the water would flow down the natural drainages. Water released would have the potential to assist in producing mesic vegetation in the draw bottoms.

2.3.9 Reclamation and Revegetation

SCM estimates that the proposed haul road would be closed sometime in 2030 or 2031. Upon closure of the road, the disturbed area would be reclaimed using a process identical to mined land reclamation described in SCM's current permit. Upon abandonment, the haul road would be regraded to the final contour as shown on the approved post-mining contour map, provided as Plate 4 in the AM5 application. All culverts and bridges would be removed with the restoration of the natural drainage pattern. Adequate measures such as, but not limited to, cross drains, dikes, or water bars will be used to prevent erosion during reclamation.

Following the completion of operations, all roads would be removed and the affected land will be regraded and revegetated.

2.3.9.1 Reseeding and Prevention and Control of Noxious Weeds

SCM has included information on how the postmine topography would be constructed, soiled, and seeded to benefit wildlife in their AM5 application. In general, reseeding would be intended to fit the planned post-reclamation land use. These plans are part of the mine reclamation plan, but would apply to the AM5 area as well.

SCM has an approved weed control plan on file with Big Horn County Weed Coordinator (7-22-2153, ARM). SCM would use weed-free seed to control noxious weeds. Herbaceous and woody riparian areas associated with Youngs Creek, Little Youngs Creek, and Squirrel Creek within the AM5 will be seeded with the approved riparian seed mixes. If mulch is used, weed-free sources would be utilized if available and cost-effective. Additionally, SCM would utilize good cultural and management practices to prevent establishment of or to control noxious weeds until Phase IV Bond Release. This final stage of bond release is complete when a mine has finalized all regrading, established revegetation to support postmining land use, and reclaimed all lands within drainage basins.

Methods of weed control include, but are not limited to: prevention, cutting or mowing, cultivation or tillage, crop or plant competition, burning, biological, and chemicals or herbicides. Implementation of these practices would adhere to established criteria as outlined by the State of Montana Department of Agriculture Environmental Management Division's County Noxious Weed Control Act, and supplemental Weed Control Guide and Title 82, Chapter 3, regulating coal mining.

2.3.9.2 Facilities Removal and Reclamation

Areas disturbed in construction of support facilities such as roads, high voltage distribution line, culverts, and fences would not be completely reclaimed until the conclusion of mining and coal processing operations. Once the AM5 roadway is no longer in use, structures that exist above the Post-Mining Topography (PMT) elevations, including but not limited to all buried wire, conduit, waterlines, culverts, and other support facilities, would be removed and all areas graded to approved contours. Structures such as concrete footers and foundations would be removed. Buried pipe, wire, and conduit that are below final PMT elevations would be abandoned in place (after ensuring that all potential hazardous fluids and materials are removed [e.g., oil]).

2.3.9.3 Stream Channel Reclamation

In all drainages determined to be Alluvial Valley Floors (AVF), alluvial soils will be salvaged. Construction across the AVFs in Squirrel Creek, Youngs Creek, and Little Youngs Creek will consist of removal and salvage of alluvial topsoil, (~12 inches), placement of a geosynthetic separation fabric above the alluvium, then construction of the haul road using material excavated from the road corridor on the adjacent valley sides. There are no alluvial soils identified in the Dry Creek area; therefore, Dry Creek will be constructed and reclaimed as any other upland ephemeral drainage.

Reclamation of the haul road corridor in AVFs will consist of removing the haul road embankment, removal and disposal of the geosynthetic separation fabric, replacement of the alluvial topsoil, and revegetation. The stream channels will be returned to their original configuration via placement of topsoil corresponding to original conditions. The geosynthetic separation fabric will be placed above the alluvium to avoid degradation of the alluvium from road fill material. This will be done to prevent the need to salvage alluvial material from under the footprint of the haul road. In addition, a geogrid may be used in combination with the separation fabric to help bridge soft alluvium.

2.3.10 Post Closure Monitoring Plans

SCM conducts a number of regular mining-related, environmental monitoring and data-gathering activities, as approved by the DEQ, outside of the SCM permit boundary, most of which require no significant disturbance. These activities would continue on all areas within the AM5 area until final bond release. The monitoring plans and activities are established, and DEQ would not be notified of activities unless they differ from those noted below.

For all of these activities, vehicular access would be by existing roads and trails, with occasional overland travel by light utility vehicles. To the extent possible, travel would be during dry conditions. Because of the nature of these activities, it is unlikely that these activities would substantially disturb the natural land surface, and would not be included in a separate monthly report above and beyond the reports that SCM must already continue to submit through bond release. In the event that weather conditions or other factors result in inadvertent significant disturbance such as rutting or tracking, SCM would repair and re-seed damage with an approved seed mix as soon as possible, and would agree to carry out this activity in compliance with the requirements of ARM Sections 17.24.1004 through 1013. In instances when SCM must repair these inadvertent significant disturbances, these actions would be conducted in such a way as to insure that the areas affected are returned to their approved post-disturbance land use and they would be reported to DEQ within a monthly report.

Resource–specific post-closure monitoring plans for groundwater, surface water, vegetation, wildlife, soils, and weather are contained in the permit.

2.3.11 Additional Permitting

Permits held or required for the AM5 area and their issuing agency are listed in **Table 2.3-4**. More detail is provided below about existing permits that will be expanded or are new to the AM5 amendment.

Table 2.3-4. Operating Permits, Licenses, and Approvals for the Spring Creek Mine and the AM5 Area.

Issuing Agency	Permit Name	Permit Number
DEQ- Coal and Opencut Mining Bureau (COMB)	Permit to Mine	C1979012
DEQ-Water Protection Bureau (WPB)	Storm Water Discharge Permit – Industrial Activity	MTR-000514
DEQ-WPB	Storm Water Discharge Permit - Construction	MTR100000
DEQ -WPB	Section 401 Clean Water Act Quality Certification	
DEQ-Air Quality Bureau (AQB)	Air Quality Permit	1120-12
Montana Fish Wildlife and Parks	318 Permit Turbidity Shoreline	318
Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)	Explosives License	9-MT-003-20-8B-00465
Mine Safety and Health Administration (MSHA)	Impoundment Permit	1211-MT-09-01457-01; -02; -03
EPA	Safe Drinking Water Act Permit	PWS-MT0003952
BIG HORN CONSERVATION DISTRICT	310 Permit Shoreline Construction	310
USACE	Nationwide 21 Permit	NWO-2014-02241-MTB
USACE	404 Permit (See 82 Fed. Reg. at 1908)	

Construction Storm Water Permit: Coverage under the Montana's General Permit for Storm Water Discharges Associated with Construction Activity (Permit Number MTR 100000) is required during the construction and reclamation phase of the project. An NOI will be filed with the DEQ for coverage under the general permit which provides permittees the authorization to discharge storm water from construction areas exceeding 1 acre in disturbance. The permit requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP) which outlines specific BMPs, inspection, and recordkeeping requirements under the permit. Following the completion of construction or reclamation activities, final stabilization of soils will be completed and a NOI will be filed with the DEQ to terminate coverage under the general permit. Concurrently with the termination, SCM would then modify their existing authorization (MTR000514) under the MSGP to include the AM5 haul road. As part of this action, SCM would update their MSGP SWPPP and long-term drainage controls will be documented, maintained, and inspected under MTR-000514.

Air Quality Permit: Spring Creek Coal, LLC (SCC) holds Montana Air Quality Permit (MAQP) #1120-12 for SCM. ARM 17.8.744(h) which states that "any activity or equipment associated with the construction, maintenance, or use of roads…" is excluded from requiring an MAQP under ARM 17.8.743. As the Proposed Action consists solely of construction and use of a road and no new stationary sources or other sources of air pollution are planned, DEQ does not require SCC to modify MAQP #1120-12. In addition, MAQP #1120-12 contains conditions requiring SCC to take reasonable precautions to control emissions of airborne particulate matter as well as to treat all unpaved roads and general plant areas with water and/or chemical dust suppressant, as necessary, to maintain compliance with the reasonable precautions requirement found in ARM 17.8.308.

A major source air quality permit would be necessary if the haul road had a maximum potential to emit (PTE) of regulated pollutants in excess of;

- 250 tons per year (TPY) as a major source for PSD permitting as specified in ARM 17.8.801,
- 100 TPY as a major source for Title V permitting as specified in ARM 17.8.1201,
- 25 TPY hazardous air pollutants (HAP), or 10 TPY for any individual HAP, as a major source for HAP for Title V permitting as specified in ARM 17.8.1201.

In the case of the Proposed Action Alternative, there are also no new stationary sources of regulated pollutants; therefore, no modification of MAQP #1120-12 would be required for continued operation of the existing mine equipment

The haul road would be subject to DEQ air quality regulations ARM. 17.8.304 and 17.8.308(2) and (3) relating to fugitive particulate matter emissions. Pursuant to ARM

17-8-304(2), haul road fugitive dust emissions would need to meet an operational visible opacity of standard or 20 percent or less averaged over 6 consecutive minutes. The same 20 percent (6 consecutive minute) average would apply during the construction of the haul road. ARM 17.8.308(3). Pursuant to ARM 17.8.308(2), SCM would also be required to take reasonable precautions to control emissions of airborne particulate matter from haul road operations. MSUMRA requires that all surface areas associated with SCM's operations be stabilized and protected in order to effectively control air pollution. Section 82-4-231(10)(m), MCA. Operators are required to employ fugitive dust control measures in accordance with 82-4-231(10)(m), MCA, the operator's air quality permit, and applicable federal and state air quality standards (ARM 17.24.761(1); 17.24.311(1)). Monitoring to evaluate the effectiveness of the fugitive dust control practices must also be conducted (ARM 17.24.761(2)).

Stream Permitting: An application has been submitted to the USACE for a Standard 404 Permit. The 404 permit involves a comprehensive evaluation of specific information related to the proposed transportation corridor including stream crossing designs and any mitigations required for disturbance or impacts to waterbodies or wetlands. Issuance of the individual 404 permit will also be conditioned upon DEQ's Clean Water Act Section 401 water quality certification. In order to grant a water quality certification for the haul road, DEQ must determine that there is reasonable assurance the haul road's construction and operation will not result in a violation of effluent limits or water quality standards ARM 17.30.106(4)(i). DEQ's water quality certification would need to include a statement of conditions which DEQ deems necessary for allowing the discharges associated with the construction and operation of the haul road, including necessary monitoring requirements (ARM 17.30.106(4)(ii)).

MSUMRA includes near-identical requirements which apply to the haul road. The revision to SCM's MSUMRA Permit will require DEQ to determine that SCM's application affirmatively demonstrates that the proposed mining operation "has been designed to prevent material damage to the hydrologic balance outside the permit area 82-4-227(3)(a), MCA. Material damage" means, with respect to the protection of the hydrologic balance, degradation or reduction of the quality and quantity of water outside of the permit area in a manner or to an extent that land uses or beneficial uses of water are adversely affected, water quality standards are violated, or water rights are impacted. Violation of a water quality standard, whether or not an existing use is affected, is material damage (Section 82-4-203(31), MCA).

The Joint Application form was used to apply for all associated permits dependent upon the particular activity (DNRC 2017). This permit combines the Montana Natural Streambed and Land Preservation Act (310), to minimize soil erosion and sedimentation for work along the streambed; the Montana Stream Protection Act (SPA 124 Permit), to protect and preserve fish and wildlife resources; and Short-Term Water Quality Standards for Turbidity (318 Authorization), to provide short-term water quality turbidity standards for construction activities and minimize sedimentation. These additional stream permits protect and preserve streams and rivers in their natural or existing state.

2.4 Agency Modified Alternative

During the development of alternatives to the Proposed Action, DEQ identified ways to lessen impacts to resources while still meeting the purpose and need of the project. Some of these mitigation measures are outside DEQ's legal purview under MEPA. Therefore, DEQ's ability to require such measures may be limited. The interagency review by the Sage Grouse Program identified mitigations that would improve compliance with Executive Orders 12-2015 and 21-2015. There are also instances in which mitigation is possible but does not fall within the scope of any government laws or regulations. In these situations, applicants have the discretion to decide whether or not to employ mitigating measures.

The Agency Modified Alternative (AMA) includes mitigations developed in cooperation with the Sage Grouse Program, the DEQ Coal Bureau, and SCM. Each mitigation measure was developed to address specific environmental impacts and to avoid, minimize, rectify, or eliminate these impacts during the three stages of the Proposed Action - construction, operation, and reclamation. Mitigations focused on reducing noise, minimizing impacts to greater sage-grouse and other wildlife, complying with Executive Orders 12-2015 and 21-2015, protecting cultural resources, improving public safety, and reducing impacts to waterways, vegetation, and wetland habitats. The following sections describe the mitigations and **Table 2.4-1** summarizes each mitigation and its resource area focus. MSUMRA includes many reclamation requirements designed to reduce or rectify project impacts to the human environment. These and other regulatory requirements are referenced in the impacts assessments in Chapter 3, and are included in the relevant sections of SCM's AM5 application, but are not restated in this EIS.

2.4.1 Mitigations Related to Greater Sage–Grouse and Other Wildlife

Aspects of the Proposed Action that were altered to reduce potential impacts to wildlife focused on how to make the roadway less of a migration barrier, minimize potential changes in predation due to road infrastructure, and reduce the level of noise at critical breeding and rearing times. Fences would be designed to make them visible to low flying birds to reduce strike hazards. Fences would also employ current best management practices to facilitate wildlife passage over or under them while still functioning to control livestock. Overhead power lines and tall poles and structures provide perches for avian predators such as raptors and corvids (magpies and crows). SCM would operationally (via fencing) limit access to approximately 7 acres along the east-central edge of the disturbance boundary to honor the recommended buffer distance (U.S. Fish and Wildlife Service 2017) around a golden eagle (*Aquila chrysaetos*) nest, reducing the overall disturbed acreage to 962.4 acres (**Table 2.3-1**).

The AMA would require the high voltage distribution line to be buried and would employ Avian Power Line Interaction Committee (APLIC) guidelines to minimize the ability of birds to use lighting poles and other tall structures as perches.

The EOs specify hours of operation and acceptable noise increase above ambient levels found to be less disruptive to greater sage-grouse during their breeding and brood rearing seasons. The EO requirements and timing restrictions have been applied to SCM's road construction, and reclamation activities to reduce noise.

2.4.1.1 Additional Mitigation Planning

The Sage Grouse Program worked with the DEQ and SCM to review the proposed AM5 amendment for consistency with Executive Order 12-2015. During project discussions conducted in early February 2018, SCM provided the Sage Grouse Program with a list, detailing efforts during project planning to select a disturbance corridor that, to the extent possible, avoided or minimized potential impacts to greater sage-grouse and their habitats during construction, operation, and reclamation. This approach was also used to balance impacts to overlapping species' needs (e.g., sage-grouse lekking and nesting raptors) to the extent practicable. Examples of these efforts, and additional voluntary actions that SCM has already implemented or has made commitments to implement on behalf of sage-grouse and their habitat, are provided in **Appendix B**. In addition to these actions, all prior DEQ permit commitments would be adhered to throughout the life of the project, including monitoring and reporting requirements.

In addition to its State permit requirements for wildlife habitat replacement, the SCM had previously developed a separate Habitat Recovery and Replacement Plan (HRRP) for sage-grouse (refer to State Mining Permit C1979012; HRRP and Section 17.24.312). The HRRP and SCM's current permit document outline multiple additional commitments to enhancing sage-grouse habitats. Those commitments are in addition to compensatory mitigation outlined below for the proposed haul road project.

2.4.1.2 Compensatory Mitigation

A collaborative process between the Sage Grouse Program and SCM identified the level of compensatory mitigation obligation for the proposed AM5 haul road project. The parties agreed to develop a compensatory mitigation approach specific to this project. Details on the rationale and specifics of this approach are provided in **Appendix B**.

SCM committed to a compensatory mitigation obligation of $1,707,353.05 to be deposited in the Montana Sage Grouse Stewardship Fund (see MCA 76-22-111((1)(a)(ii)). Funds would be deposited after confirmation of approval for both the permit amendment and the compensatory mitigation plan, and before construction begins.

The MSGOT and the Sage Grouse Program would disburse these funds through the Stewardship Account granting process to conserve habitat and sage-grouse populations through offsite mitigation. Offsite mitigation is preferred in this case due to the existing mining activity in the immediate area and the new addition of the haul road. Any benefit of onsite mitigation would be negated until such activities were completed and disturbed lands fully reclaimed. Greater conservation benefits to sage-grouse can be secured offsite.

2.4.2 Mitigations Related to Surface Water and Aquatic Habitats

The AMA requires that in-stream construction take place during periods of low to no flow in these intermittent streams as well as in wetland areas with compactable soils.

2.4.4 Mitigations Related to Noise Control

In addition to the timing restrictions listed in Section 2.4.1 and in Table 2.4-1, the AMA includes using alternatives to back-up alarms to reduce equipment noise at the source. The AMA also calls for placing larger soil berms where they would provide a barrier between the equipment and lek sites. The berms may reduce the transmittal of noise over the landscape as well as providing a visual screen. The AMA does not require additional berms or soil stockpiles, but allows for more strategic placement of these piles.

2.4.5 Unanticipated Discoveries Related to Cultural Resources

The AMA would require a tribal representative and/or qualified archaeologist on site during construction.

2.4.6 Summary of Mitigations

The following tables summarize the proposed mitigations that would reduce, minimize, or avoid potential impacts to the human environment of the Proposed Action as currently planned. As noted above, this list was developed while avoiding duplicating requirements that fall under MSUMRA or other regulations. The tables each focus on one stage of the project - construction, operation, and reclamation. Some mitigations would apply in more than one stage and are repeated accordingly.

Table 2.4-1 Mitigations Developed for the AM5 Project. An "X" Denotes that a Resource Area is the Focus of a Stated Mitigation. Bold rows denote mitigations that SCM has voluntarily agreed to implement; these would be part of the Preferred Alternative and the Agency Modified Alternative. (Ackerman 2018). Shaded rows would only occur under the Agency Modified Alternative.

SG	Sage Grouse		AQ	Aquatics		N	Noise		PS	Public Safety
EO	Executive Order		CR	Cultural Resources		WL	General Wildlife		VW	Vegetation & Wetlands

Mitigation during CONSTRUCTION	**SG**	**EO**	**N**	**WL**	**AQ**	**CR**	**PS**	**VW**
Bury the powerline and/or limit other light poles and other potential perches	X	X		X				
Control trash and other attractants to minimize predator presence (raptors, corvids, bears).	X	X		X				
Fencing: Build to standards for sage-grouse and big game, place fencing as close to the road berm as possible. Where this is not possible, install markers onto fence wires following NRCS guidelines for sage-grouse.	X	X		X				
Seasonal Timing Limitations: NSO between March 1 and July 15.	X	X	X	X				
Blasting: Limit to daytime hours and comply with the requirements of Administrative Rules of Montana (ARM) 17.24.624 and 17.24.159.			X					
Timing: No construction between hours of 6 p.m.to 8 a.m. from March 1 - July 15. Per the EO, the L_{50} noise levels, either individual or cumulative, should not exceed 10 dBA above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1 – July 15). To ensure compliance, conduct continuous noise level monitoring during the above timeline and hours at the active sage grouse lek perimeters. If noise levels are exceeded, confine construction/reclamation work to between the hours of 8:00 a.m. to 6:00 p.m. during sage grouse breeding season (March 1 – July 15).	X	X	X	X				
Strategically place cut and fill material to create barriers (e.g., berms, soil stock piles, etc.) or road cuts that act as barriers, to block the direct line-of-sight between the road, residences, sage grouse leks and other noise-sensitive wildlife areas (e.g., raptor nests). If the barriers are high enough to block the line of sight, a 5 dBA or greater equipment noise reduction can be achieved.	X	X	X	X			X	
Place stationary noise sources away from receptors (e.g., raptor nests, sage grouse leks and residences).	X		X	X				

Table 2.4-1 Mitigations Developed for the AM5 Project. An "X" Denotes that a Resource Area is the Focus of a Stated Mitigation. Bold rows denote mitigations that SCM has voluntarily agreed to implement; these would be part of the Preferred Alternative and the Agency Modified Alternative. (Ackerman 2018). Shaded rows would only occur under the Agency Modified Alternative.

SG	Sage Grouse		AQ	Aquatics		N	Noise		PS	Public Safety
EO	Executive Order		CR	Cultural Resources		WL	General Wildlife		VW	Vegetation & Wetlands

Mitigation during CONSTRUCTION	SG	EO	N	WL	AQ	CR	PS	VW
Funnel stored storm water from ponds to areas containing or having the potential to produce mesic vegetation important to sage grouse broods. Areas could be located on both sides of the AM5 corridor and far enough away from the corridor, but within the AM5 permit area, in order to potentially minimizing sage grouse broods crossing the roads.	X			X	X			X
Turn idling equipment off. Use quieter equipment with high-grade mufflers, engine intake silencers, engine enclosures, noise blankets, and rubber linings.	X	X	X	X				
On all diesel-powered construction equipment, replace standard back-up alarms with MSHA approved broadband alarms that limit the alarm noise to 5 to 10 dBA above the background noise.	X	X	X					
Limit work to daytime hours (7:00 a.m. to 10:00 p.m.) between Youngs Creek Road and the Wyoming State Line to protect nearby residence from nighttime disturbance.			X					
Enhance likelihood of wildlife using the culverts as crossings by consulting the latest research e.g., Wildlife Crossing Structure Handbook - Design and Evaluation in North America; US Department of Transportation Federal Highway Administration; Publication No. FHWA-CFL/TD-11-003.				X	X			
Construct sections near or crossing streams during low flow periods.				X	X			X
Construction Monitoring: Have a tribal representative and/or qualified archaeologist on site during construction.						X		
Road Crossing: Design the berms on either side of the haul road at the Youngs Creek Road crossing to improve sight distance for vehicles on both Youngs Creek Road and the haul road as a precaution in case the gate malfunctions.							X	
Keep construction equipment out of wetland/ riparian/ saturated areas, or time construction for when the ground is frozen to minimize soil compaction.				X	X			X

SG	Sage Grouse		AQ	Aquatics		N	Noise		PS	Public Safety
EO	Executive Order		CR	Cultural Resources		WL	General Wildlife		VW	Vegetation & Wetlands

Mitigation during OPERATION	**SG**	**EO**	**N**	**WL**	**AQ**	**CR**	**PS**	**VW**
Timing: Operation – No hauling between 4:00 to 8:00 a.m. and 7:00 to 10:00 p.m. March 15 to July 15.	X	X	X	X				
Timing: Operation- Per the EO, the L_{50} noise levels, either individual or cumulative, should not exceed 10 dBA above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1 – July 15).	X	X	X	X				
Turn idling equipment off.	X	X	X	X				
If allowable under MSHA requirements, reduce or minimize lighting needs for nighttime operation, use downward directed lighting to minimize impact to dark sky conditions.	X			X				
Land management: Modify grazing lease to support cheatgrass control, keep livestock out of sage grouse brood habitat, and minimize impacts to riparian areas. Include fencing and grazing rotations to meet goals.	X	X		X	X			X
Control trash and other attractants to minimize predator presence (raptors, corvids, bears).	X	X		X				
Establish fuel stations at mine facilities at either end of the roadway rather than using mobile fuel trucks to reduce the potential for spills and contamination.	X	X		X	X			X
Warning signage with flashers be installed in advance of the crossing for vehicles on Youngs Creek Road approaching the gate. If the gates are being controlled by an electronic sensor, the same sensor could be linked to the flasher on the warning sign to tell drivers they are approaching a closed gate.							X	
Adequately light gates with overhead lighting and/or flashers mounted on the gates to ensure they are visible at night. All lighting shall be of minimum necessary brightness consistent with worker safety (MSHA).							X	

SG	Sage Grouse		AQ	Aquatics		N	Noise		PS	Public Safety
EO	Executive Order		CR	Cultural Resources		WL	General Wildlife		VW	Vegetation & Wetlands

Mitigation during RECLAMATION	**SG**	**EO**	**N**	**WL**	**AQ**	**CR**	**PS**	**VW**
Timing: Reclamation – No work between 4-8 a.m. and 7-10 p.m. from March 15 to July 15.	X	X	X	X				
Timing: No activity between hours of 6 p.m.to 8 a.m. from March 1 - July 15. Per the EO, the L_{50} noise levels, either individual or cumulative, should not exceed 10 dBA above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1 – July 15). To ensure compliance, conduct continuous noise level monitoring during the above timeline and hours at the active sage grouse lek perimeters. If noise levels are exceeded, confine construction/reclamation work to between the hours of 8:00 a.m. to 6:00 p.m. during sage grouse breeding season (March 1 – July 15).	X	X	X	X				
Turn idling equipment off. On all diesel-powered construction equipment, replace standard back-up alarms with MSHA approved broadband alarms that limit the alarm noise to 5 to 10 dBA above the background noise.	X	X	X					
Enhance wildlife habitat off-site for species other than sage-grouse and the required wetland mitigation.		X		X				
Remove culverts during low or no-flow periods (e.g., late summer or fall) to minimize sediment transport and deposition in streams.	X			X	X			X
Conifer removal- areas where conifers were present prior to construction should be revegetated with species more conducive to sage grouse or wildlife habitat.	X			X				X
Continue grazing plan consistent with enhancing nesting and brood rearing habitats and residual vegetation.	X			X				X
Decommissioning all roads and pipeline routes where appropriate to enhance sage-grouse habitat. Surfacing materials should be removed and the disturbed areas reseeded with a seed mix which includes Wyoming big sagebrush and native grasses and forbs found on the impacted sites.	X	X		X				X
Remove all fencing, culverts, structures, poles, and perches.	X			X				

Measures that have been **bolded** in the table above are the items SCM has agreed to voluntarily implement (Ackerman 2018). These would become part of the Preferred Alternative and the Agency Modified Alternative. Items that are listed in plain text would be part of the Agency Modified Alternative, but would not be implemented under the Preferred Alternative.

2.5 Alternatives Considered but Dismissed

Under MEPA, a reasonable alternative is one that is practical, technically possible, and economically feasible. In addition, any alternative under consideration must be able to meet the purpose and need of the Proposed Action. During scoping, alternatives to the Proposed Action were suggested and discussed by agency representatives and SCM. Alternatives covered in this section include alternatives or alternative components that were considered and eliminated from detailed study. For each alternative discussed, a synopsis of the changes proposed and a discussion of why the alternative or component was dismissed is included. SCM has applied to DEQ for a haul road and pursuant to 75-1-220(1), MCA, DEQ cannot include an alternative facility or an alternative to the proposed project itself. The alternatives considered but dismissed in the following section have been dismissed pursuant with 75-1-220(1), MCA and other identified technical issues below.

2.5.1 Slurry Pipeline

An above-ground slurry pipeline was proposed as an alternative for transporting the coal from YCM to SCM within the AM5 boundary. The slurry pipeline alternative would need to include a maintained access road to meet the need of SCM to transport equipment and personnel between SCM and YCM. Slurry pipelines involve pulverizing coal, blending it with water, and pumping it through a pipeline to a destination. At the destination, the pulverized coal is separated from the carrier liquid, often by centrifuging (Rieber and Soo 1977). Although shorter slurry pipelines are reportedly common for transportation of mine tailings and other waste materials, the last example of an operating coal slurry pipeline of any size in the United States was the 273-mile-long Black Mesa Pipeline in Arizona which closed in 2005 (CLUI 2012). The water needed for Black Mesa was unsustainable and the power generating station supplied by the pipeline was closed as a result.

Slurry pipelines can be either one-way or recirculating, the latter design returning water extracted from the slurry back to the upstream side for re-use. Non-recirculating pipelines are reported to require 220 to 270 gallons of water per ton of coal transported, whereas recirculating pipelines reportedly require as little as 50 to 75 gallons per ton. The total amount of water needed would be dependent on the rate of coal transport. For the current level of 10 million tons of annual coal production at SCM, this would require 6,752 to 8,286 acre-feet per year for a non-recirculating pipeline and 1,534 to 2,302 acre-feet per year for a recirculating pipeline. Recirculating pipelines require a greater initial capital investment (to build two pipelines instead of one) and have higher operation costs arising from the additional pumping and maintenance required (Beach 2013).

The main benefit to a slurry pipeline would be low operating and energy costs compared to other methods. The footprint for a slurry pipeline and total area of disturbance would be smaller than what is proposed for a haul road, but a service road would be needed to maintain the pipeline. Therefore, some of the traffic and noise for operation would still occur. The amount of water required to operate a slurry pipeline would be the most of any potential alternative. From a water rights perspective, the amount of water needed far exceeds SCM's existing water rights, and according to the Montana Department of Natural Resources and Conservation, there is no water legally available for new appropriation in the Tongue River basin in Montana in the amount required to operate the pipeline, so water would need to be secured from another source. Another critical concern is that the coal would need to be pulverized prior to being placed in the pipeline. This would require processing equipment at the YCM site, which would negate the need to transport the coal to SCM.

Other potential drawbacks to a coal slurry pipeline include:

- Significant processing of the coal is required on both the upstream and downstream ends of the pipeline, requiring additional plant facilities and increasing up-front capital costs
- The potential for environmental damage in the case of a pipeline rupture
- Slurry pipelines offer the least operational flexibility of any alternative. Once flow in the pipeline is started, it cannot be easily stopped and re-started because coal particles will settle out of the slurry and plug the pipeline. (Rieber and Soo 1977)

This alternative was dismissed due to the lack of a sufficient water source and unlikely availability of adequate water rights to provide a sufficient amount of water to operate the pipeline, increased cost for construction, the potential for haul capability interruption, and the need for processing facilities at both ends of the route. Also, a standard-sized service road would be too narrow to meet the need for a transportation corridor for moving larger coal equipment such as the haul trucks between the YCM and SCM.

2.5.2 Conveyor

Conveyors are a common, well-established means for coal transport over a wide range of distances, up to tens of miles. The primary benefits of coal conveyor systems include their ability to take direct routes over rough terrain, carry large tonnages, and their comparatively low staffing requirements once operational (Rieber and Soo 1977). Furthermore, water usage is relatively low (less than 1 gallon per ton), and usually limited to dust control and/or belt cleaning (Beach 2013).

However, there are also numerous shortcomings to the conveyor transportation approach. Conveyors are not adaptable to declining or increasing mine production. Therefore, capitalization is required for anticipated maximum production on the front end of the project whether YCM produces 5 million tons/year or 15 million tons/year. Conveyors require a water pipeline for dust suppression and the pipeline would need to be run when empty during winter to keep from icing up. Because conveyors require constant inspection and maintenance, a 12 foot-wide, all-season service road beneath or adjacent to a conveyor would be constructed and maintained. For the length of conveyor(s) required for this project, two plant personnel with two pickup trucks per work-shift would be required to maintain operations (Ackerman 2017j). Stream crossings of the conveyor would be overhead, but road crossings would also be required and sufficiently engineered and constructed to pass at least a 25-year event and support large maintenance trucks such as those necessary to transport conveyor rollers and belts (Ackerman 2017j).

In addition to the infrastructure limitations, because practical conveyors are above-ground, they impose an adverse effect on the viewshed along the length of a route. All lengths of the conveyor provide opportunity for raptor perching and nesting, but elevated and trestle lengths would be especially inviting and pose a concern relative to Migratory Birds of High Federal Interest (MBHFI), raptors, and sage-grouse related issues (Ackerman 2017j).

Although a conveyor and associated towers would operate at noise levels between 53 and 73 dBA and would be quieter than the large Komatsu trucks (89 dBA) proposed for hauling, the noise from the conveyor would be constant and sustained along the entire length. Additionally, a conveyor system would need to be built for its maximum anticipated throughput, which further increases already high up-front capital costs. This lack of scalability can lead to operation at partial capacity for periods of time. Other practical considerations include the necessity for dust control along the conveyor, the potential need for pre-crushing to minimize spillage, similar to the requirements for the slurry pipeline, and the fact that a single failure anywhere along the conveyor completely shuts down the entire transportation link, leaving no options to re-route material (Rieber and Soo 1977; Ackerman 2017j). Conveyor operation is also very energy-intensive compared to other coal transportation modes (Beach 2013).

In summary, a conveyor would require a support road and water pipeline and either movement of construction and extraction equipment to YCM by public road or a rough grade road which would create impacts similar to the Proposed Action, if on a smaller scale. The conveyor alignment would present additional unique challenges due to the extremely rough and varied topography (**Figure 2.5-1)**. While there are several on-grade conveyors operating in the Powder River Basin, the topography associated with this alternative analysis is such that trestles and transfer points would be necessary to assure reliable operation. In addition, unlike a haul road where trucks and loaders can be incrementally phased in or out with capital expenditures matching production levels, conveyors must be designed and constructed to carry the maximum anticipated annual production, but during early years and periods of low production, unit costs are escalated by up-front capitalization and set operational costs (Ackerman 2017j).

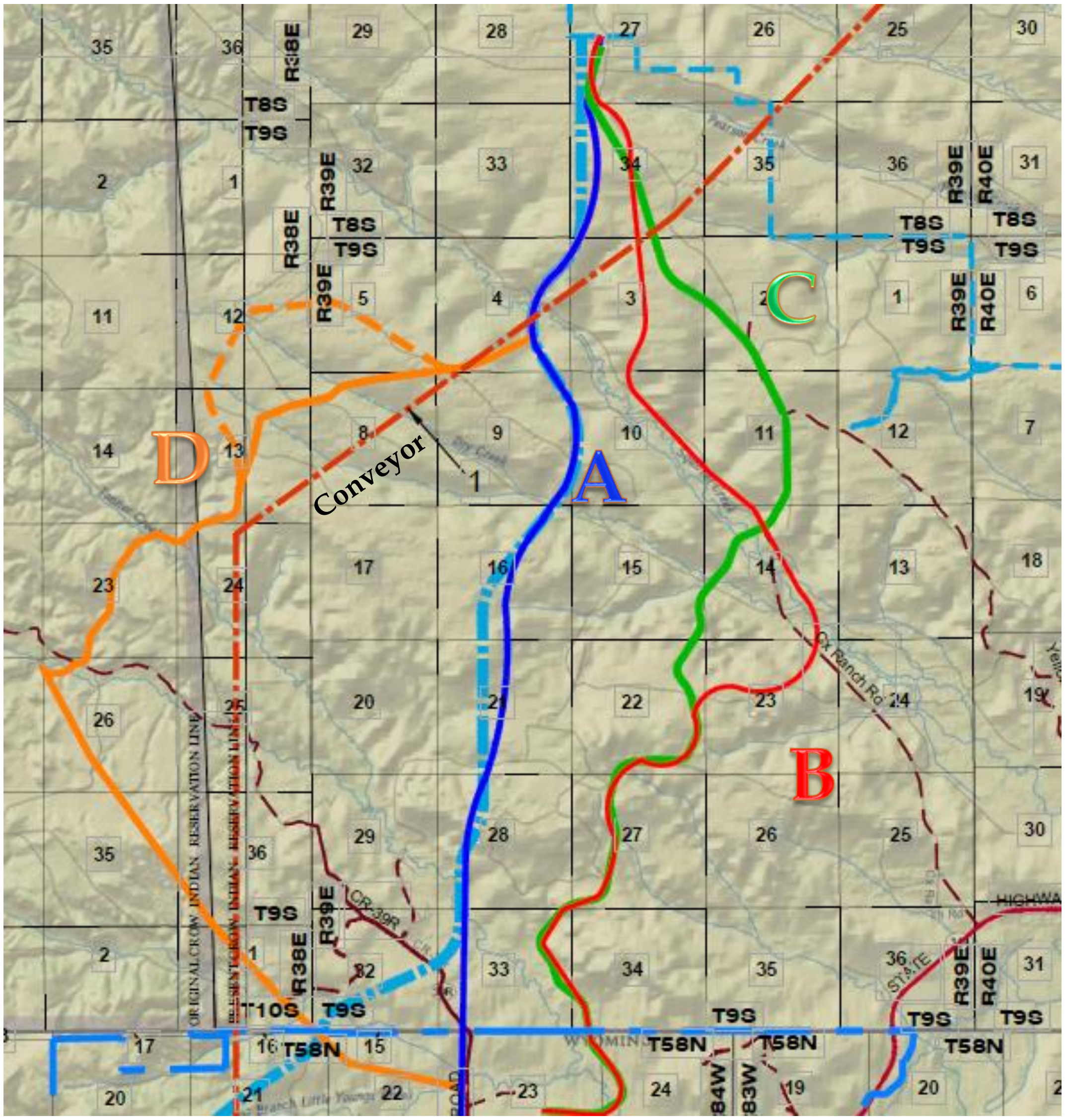


Figure 2.5-1. Alignments for Haul Routes and Conveyor Alternatives Considered but Dismissed.

This alternative was dismissed due to the increased cost for construction, the potential for haul capability interruption, potential impacts to wildlife, and the need for processing facilities at both ends of the route. The conveyor alone would also not meet the need for a transportation corridor for moving larger coal equipment such as the haul trucks between the YCM and SCM.

2.5.3 Railroad Spur

Advantages of rail haulage include no requirement for preprocessing coal prior to loading, high energy efficiency (estimated at one quarter of the energy demand for truck haulage (Beach 2013), and low transportation costs compared to trucking or conveyor haulage. However, rail transportation costs can begin to approach those of truck haulage as the transportation distance decreases below 100 miles (Beach 2013). Initial capital costs for a new railroad would be high. As an example, in 2008, construction of the Bull Mountain Railroad, encompassing 35 miles intended for unit trains serving the Bull Mountain Mine near Roundup, Montana, was estimated to cost around $100 million, or $2.9 million per mile (Associated Press 2008).

Furthermore, incorporating a railroad into the operations plan would trigger additional levels of regulatory involvement. The Interstate Commerce Commission Termination Act (ICCTA) of 1995 gave the Surface Transportation Board exclusive jurisdiction over rail transportation as well as construction, operation abandonment, or discontinuance of spur sidetracks, or facilities, even if the tracks are located entirely in one state (49 USC § 10501 (b)) (Kamptner 2015).

The construction of an active rail line would require potential changes to the design of the alignment to accommodate grade capabilities, safety considerations at road crossings, and additional impacts to wildlife due to noise and the potential for collisions. Railroad grade limitations would affect the alignment and would likely necessitate greater fill to reduce the overall grade from the eight percent that the Komatsu trucks can manage to the approximately three percent maximum that a heavily loaded coal train can handle. Similar to the conveyor alternative, any mechanical problems with the rail line would necessitate shutdown of all transportation until the problem could be remedied. As with the other alternatives, a service road would need to be constructed parallel to the rail line which would mean that many of the impacts from support traffic, associated noise, and stormwater management would be retained. In addition, the noise level of a train would be difficult to mitigate in the absence of the roadside soil berms, which would no longer be needed.

This alternative was dismissed due to the lack of substantial reductions in noise impacts, difficulty in meeting the grade limitations, increased infrastructure needs, and high construction and maintenance costs. Similar to the slurry pipeline and conveyor alternatives, the service road for this alternative would fail to meet the need for a transportation corridor for larger coal equipment.

2.5.4 Using Existing State and County Roadways

SCM could haul coal from YCM into Montana using Wyoming State Highway 338, Montana State Highway 314, and Youngs Creek Road (County Road 39R). Coal would be hauled using highway-legal trucks or a combination of highway-legal trucks and a transfer station within the SCM permit boundary to larger Komatsu 240-ton class trucks for transport to the SCM processing facility.

In order to haul the same quantity of coal using highway-legal trucks, SCM would need approximately eleven, 22-ton trucks to carry one load for the Komatsu 240-ton truck. At the planned level of 4 of the 240-ton truck crossings per hour, every hour on the AM5 route, this would scale up to more than 2,600 additional truck trips per day (**Table 2.5-1**). This would constitute a very large increase in truck traffic on Montana roads, and would raise concerns for public safety on these secondary roadways. The large amount of heavy truck traffic would increase the wear and tear on the road surfaces and would likely require adding turning lanes and widening the roads. As a comparison, Interstate 90 near the Montana Wyoming border records an average annual daily traffic (AADT) of 3,800 to 4,500 vehicles (MDT 2017).

Table 2.5-1 Annual Average Daily Traffic Data for Montana Roadways Near the Proposed SCM Haul Corridor.

Roadway	Location	2013	2014	2015	2016	Predicted Increase (22-ton trucks)
MT 314	South of Decker	810	820	840	753	2,640
MT 314	North of Decker	630	610	630	622	2,640
I-90	MT/WY Border	4,580	3,889	3,880	3,736	NA

Source: MDT 2017

In addition, this route would increase the total distance travelled from nine miles to 27 miles. This alternative was dismissed from further consideration due to the increased infrastructure needs, additional permitting required, higher transportation costs, and concerns for public safety.

2.5.5 Other Alignments Considered but Eliminated

SCM analyzed at least five distinct alternatives to the selected corridor route (**Figure 2.5-1**) to identify the option that would result in the least potential to affect various resources of concern (wetlands, cultural resources, wildlife and wildlife habitats) during construction, maintenance, and operation of the road. One alternative route was considered to the west of the AM5 area (Route D). However, this route and a slight modification would require crossing lands not currently owned or available for lease by SCM, as well as the Crow Indian Reservation. These routes were longer than the Proposed Action and intersected similar amounts of greater sage-grouse core habitat. The increased length and resulting larger footprint of these alternatives would have increased impacts to vegetation and wildlife resources in the study area compared to the proposed route.

Two alignments, Routes B and C, were also plotted to the east of the preferred alternative (**Figure 2.5-1)**. However, both of these alignments would be longer than the proposed AM5 route, including longer sections that would traverse greater sage-grouse core habitat. In addition, both routes were closer to a greater number of known, intact raptor nest sites, and would impact more acreage of black-tailed prairie dog colonies, including one colony historically used by breeding greater sage-grouse. Because of the potential for greater impacts to greater sage-grouse and grouse habitat, and problems obtaining necessary water rights, these alternative alignments were dismissed from further consideration (Ackerman 2017j). The fifth alternative alignment (Route A) was eliminated because an extensive cultural resource site which is eligible for listing on the National Register of Historic Places site. (Ackerman 2017j). This route was modified slightly to avoid the cultural site and to reduce impacts to wetland areas. It is now the route for the Proposed Action.

2.5.6 Alternative Culvert Designs

The haul road between SCM and YCM requires stream crossings on perennial to intermittent Squirrel, Youngs, and Little Youngs creeks, in addition to a crossing on Dry Creek, an ephemeral stream. The Proposed Action includes use of cylindrical and elliptical corrugated or multi-plate metal culverts of various diameters at stream crossings (**Table 2.3.3**). Two alternatives which were considered but dismissed from further analysis include using either bottomless or embedded culverts at these crossings (Schmitt et al. 2018).

Bottomless culverts and embedded culverts are primarily used to preserve intact or mimic natural streambed conditions and hydraulic properties, and are typically found in pedestrian path to highway scale crossings. Three factors preclude the use of bottomless or embedded culverts in the AM5 haul road: stream sinuosity, gradient, and the roadbed width of proposed crossings.

Sinuosity is a relationship between stream length and gradient distance. Steeper slopes result in less sinuosity, where flatter slopes typically result in broad valleys, with wider channel meanders and more lateral channel migration. The affected reaches of streams in the AM 5 corridor are sinuous with wide alluvial floors and meander widths of up to, approximately, 200 feet.

Stream gradient is a relationship of elevation difference over the length of a channel, which may be measured as hydraulic gradient (which fluctuates throughout the year) and streambed gradient. Existing gradients in the streambeds through the affected area range from 0.1% to approximately 1.5% (Stagliano 2015). As gradient increases, sinuosity decreases. To maintain stream gradient the stream length must be maintained. Increases in gradient also result in increased velocity, accelerated erosion, and increased sediment migration.

Due to the nature of local terrain and necessary grades for coal haulage, proposed roadbed widths range from 386 to 668 feet. As culvert length generally relates to road base width in valley-fill construction, the culverts at the stream crossings on the AM5 haul road would be required to be long structures.

To preserve intact streambed conditions in affected streams, bottomless culverts would need to be channel spanning structures of impractical dimensions (Schmitt et al. 2018). Installation of such features would result in additional disturbance to alluvium. Installation of available precast or modular members would invariably constrict the channel, increasing the gradient and defeating the purpose of a bottomless culvert.

Embedded culverts offer no practical advantage in this application, as native sediment is not expected to be retained due to the hydraulic implications of the structure length, straightening the channel, and constraining the channel (Schmitt et al. 2018). By embedding the culvert, additional disturbance to the alluvium is required.

The MSUMRA includes specific language related to stream diversions, these diversions must meet best technology currently available (BTCA) requirements. Given MSUMRA requirements, the physical properties of the streams, and requirements of the haul road, analysis concluded that cylindrical culverts installed as proposed in the AM5 application and the Amy Corps of Engineers Section 404 permit would be the appropriate BCTA for the Proposed Action (Schmitt et al. 2018). The stream crossings, installed as proposed, would accomplish the goals of the project while minimizing environmental impacts to the extent possible.

Table 2.5-2 Summary of Rationale for Each Alternative Considered but Dismissed

Alternative	Route Length[1] (miles)	Disturbed Area Footprint[2] (acres)	Reasons for Dismissal	Meets Purpose and Need for Transport? Coal	Equipment
Slurry Pipeline	9	120	Unable to support water needed for operation Impractical operation requirements Repairs require entire system shut down Requires additional processing facilities at YCM Requires a service road, so retains many impacts of Proposed Action	Yes	No
Conveyor	9	120	Not scalable to production level Would establish a perching site for predators that would not comply with EO 12-2015 Repairs require entire system shut down Requires additional processing facilities at YCM Requires a service road, so retains many impacts of Proposed Action	Yes	No
Railroad	12-14	340	Grade limitations would require additional fill and/or length High construction and maintenance costs Noise levels would be above requirement for compliance with EO 12-2015 Repairs require entire system shut down	Yes	Possibly
Use Public Roadways	27	None	Increased length of route and associated costs for fuel Potential impacts to public safety from increased traffic Impacts to public roadways; increased wear and tear	Yes	No
SCM Route D	11.9	427	Not able to obtain legal access to a portion of the alignment Crosses a similar amount of greater sage-grouse core area compared to the Proposed Action	Yes	Yes
SCM Route B	9	322	Larger riparian and wetland acreage impacts Crosses a larger portion of greater sage-grouse core area Closer to a greater number of known, intact raptor nest sites Impacts more acreage of black-tailed prairie dog colonies, including one colony historically used by breeding sage-grouse	Yes	Yes
SCM Route C	9.5	341	Crosses a larger portion of greater sage-grouse core area Closer to a greater number of known, intact raptor nest sites Impacts more acreage of black-tailed prairie dog colonies, including two colonies historically used by breeding sage-grouse	Yes	Yes

Table 2.5-2 Summary of Rationale for Each Alternative Considered but Dismissed					
Alternative	Route Length[1] (miles)	Disturbed Area Footprint[2] (acres)	Reasons for Dismissal	Meets Purpose and Need for Transport?	
				Coal	Equipment
SCM Route A	8	287	Impacts to known cultural site eligible for listing on the National Register of Historic Places Greater impacts to wetlands Route revised in consultation with USACE to become Proposed Action	Yes	Yes
Alternative Culvert Designs	Same as Proposed Action	Same as Proposed Action	Increased required disturbance of alluvial layers. Size of bottomless culverts would be impractical to engineer. Embedded culverts would not reduce slope, erosion potential, or velocity of water carried by culverts.	Yes	Yes

1 Estimated length assuming that routes for the slurry pipeline and conveyor would be within the AM5 permit boundary. The railroad alignment was not mapped. Length range is estimated based on reduced grade requirements.

2 Acres of disturbance for the final structure using industry standards for width and rights of way for the various alternatives.

Chapter 3 : Affected Environment and Environmental Consequences

The affected environment section provides a baseline of information from which to analyze and compare the effects of the alternatives. The analysis of environmental consequences is based on a thorough review of relevant scientific information, an evaluation of proposed and industry practices, regulatory requirements, and results from on-site surveys and studies. Each resource area discussion includes information on the data reviewed, how each data source was collected, and the geographic limits of the review. Most resources are described for the area in and around the AM5 boundary, but some may cover larger areas relevant to the potential for impacts. As an example, socioeconomic data are presented for Big Horn County. MEPA requires that the impacts analysis be confined to the area within Montana's borders (75-1-201(2)(a), MCA).

3.1 Location Description and Study Area

The proposed AM5 area is approximately 15 miles north of Sheridan, Wyoming in Big Horn County, Montana. The AM5 area encompasses approximately 4,334 acres south of the existing SCM permit boundary to the east of the Wolf Mountains (Figure 1.3-1). The climate in the vicinity of the proposed project is continental, having cold winters and warm summers with a growing season extending from May 25 to September 14 (averaging 111 days) over the 30-year period of record from 1981 to 2010 at the Busby station 32 miles to the north (NOAA 2015). Scow (2017) used meteorological data collected at the SCM from 1990 to 2014 and determined that the average daily temperatures range from a low of 19.6° F in January to a high of 76.2° F in July. Average total precipitation as measured at the Decker, Montana station is just under 12 inches for the period of record from 1980 to 2010 (WRCC 2017).

Big Horn County, Montana has a human population density of approximately 3 people per square mile, slightly less than half that of Montana's overall reported 6.5 people per square mile. Sheridan, Wyoming is the largest town within 50 miles of the project area with a population of approximately 18,000 according to the 2015 US census. The Crow and Northern Cheyenne Indian Reservations are nearby with 7,900 and 4,900 residents, respectively. The Tongue River is the largest waterway in the area, and Tongue River Reservoir is a popular recreation site.

3.2 Geology and Minerals

The Proposed Action and project alternatives have the potential to affect geology and minerals in the Project area. This section provides a description of the general and AM5-specific geologic setting, as well as a discussion of environmental consequences related to geology and minerals.

3.2.1 Analysis Methods

The primary sources of information and geologic interpretation for this section were provided in the AM5 application, specifically, AM5 Appendix N: Topography, Geology, Mineral Assessment, and Strata Quality Characteristics (Aqua Terra Consultants, Inc. 2015b) and Appendix L: Probable Hydrologic Consequences Update (Nicklin Earth and Water 2017). Additional data sources included scientific reports prepared by the U.S. Geological Survey (USGS) for the area, and other sources which are cited in the text.

3.2.2 Affected Environment

The AM5 area is located in the northwest part of the Powder River Basin, which is a geologic basin with up to 25,000 feet of sedimentary rocks, spanning from northeast Wyoming into southeast Montana (Ver Ploeg et al. 2008). The Powder River Basin has a long history of energy development and production activities. Small-scale coal mining has occurred in the basin throughout the 20th century, with large-scale open-cut mining of thick, near-surface coal beds beginning in the Project area during the 1970s (Slagle 1983). Additionally, natural gas production (in the form of coal-bed methane) began in the basin (including the AM5 area) in the late 1990s, reached a peak in the late 2000s, and entered a rapid decline shortly thereafter (Kuzara et al. 2016). To a lesser degree, traditional oil and gas production has occurred historically in the Powder River Basin (Slagle et al. 1985; Aqua Terra Consultants, Inc. 2015b).

3.2.2.1 Geologic Setting

In southeast Montana, the Powder River Basin surface is characterized by rolling upland topography consisting of ridges and buttes capped by erosion-resistant sandstone and clinker. Clinker is rock baked and hardened by naturally burning coal, also referred to as scoria (Slagle et al. 1985). Surficial and near-surface geology is dominated by southeast-dipping sedimentary rocks of the Tongue River Member of the Fort Union Formation and the Wasatch Formation, as well as by unconsolidated alluvial deposits associated with stream valleys (Vuke et al. 2007). The upland topography is dissected by steep-walled valleys cut by streams, the largest of which flow through alluvial plains that have developed in the valley bottoms (Slagle et al. 1985). From hilltops to valleys, relief in the area typically ranges from 100 to 500 feet (Slagle et al. 1985), with maximum topographic relief in the AM5 area reported to be 550 feet (Aqua Terra Consultants, Inc. 2015b). Topographic maps provided in the AM5 application indicate the minimum elevation in the AM5 area is about 3,650 feet at Youngs Creek and the maximum elevation is nearly 4,200 feet near the southern extent of the current SCM permit boundary.

3.2.2.2 Geologic Formations

General surficial and bedrock geology of the AM5 area is shown on the Montana Bureau of Mines and Geology *Geologic Map of the Birney 20′ x 60′ Quadrangle, Eastern*

Montana (Vuke et al. 2007), and a series of detailed, site-specific geologic cross sections are included in AM5 application Appendix N (Plates N-2 through N-9). Generalized geologic units exposed in the Project area include stream channel alluvium, the Wasatch Formation, and the Tongue River Member of the Fort Union Formation (Vuke et al. 2007).

Together, the Wasatch and Fort Union Formations are up to 3,000 feet thick in the Project area, with up to 300 feet of the Wasatch Formation exposed (Aqua Terra Consultants, Inc. 2015b). A generalized summary of near-surface geologic map units in the Project area is presented in **Table 3.2-1**. Due to the shallow nature of potential disturbance activities (on the order of 10s to 100s of feet) compared to the combined thickness of these geologic units (1,000s of feet), it is not anticipated that geologic impacts (if any) of the alternatives will extend to any formations deeper than those listed in **Table 3.2-1**.

Table 3.2-1. Summary of Project Area Geologic Map Units listed from Youngest to Oldest.

Formation	Lithology	Thickness
Alluvium of modern channels and flood plains	Sand, silt, clay and gravel deposited in stream and river channels and flood plains. Light-gray to light-brown	Typically < 15 feet Up to 35 feet
Clinker	Rock of the Fort Union or Wasatch Formation metamorphosed (baked) by naturally burning underlying coal seams, resulting in hard, erosion-resistant red, pink, orange, yellow and black rock.	10–500 feet
Wasatch Formation	Yellowish-gray to light-gray siltstone and sandstone interbedded with gray shale, coal, clinker, and coquina (shell fragments).	Up to 600 feet
Tongue River Member – Fort Union Formation	Fine-grained sandstone with interbeds of siltstone, mudstone, and coal. Source of coal mined at SCM and other local mines.	Up to 700 feet exposed in local area

Source: Vuke et al. (2007)

Bedrock formations in the Project area are nearly flat-lying or dip gently 1–2 degrees to the southeast. Structural features present within the AM5 area include local-scale folds and faults, which have led to variation in the regional attitude of the bedrock in the Project area. Faulting has also caused localized displacements of at least 150 feet in parts of the AM5 amendment (Aqua Terra Consultants, Inc. 2015b).

3.2.2.3 Physical and Geochemical Characteristics

In Appendix N of the AM5 application, SCM provided a qualitative assessment of physical and geochemical characteristics of rock types in the AM5 area, which are summarized in **Table 3.2-2**. In the AM5 area, the more general geologic units listed in **Table 3.2-1** comprise these specific rock types.

Additionally, DEQ requires coal permit applicants to conduct overburden quality sampling, as described in the guidance document titled *Soil, Overburden and Regraded Spoil Guidelines, December 1994, Updated August 1998* (DEQ 1998). This sampling is required to evaluate the suitability of overburden for placement in the plant rooting zone and for its potential effects on groundwater and surface water following reclamation (DEQ 1998).

SCM conducted chemical and textural quality analysis of geologic material on samples from 10 borings installed for the AM5 project in 2014, and on samples from four historic borings, in general accordance with analytical requirements set forth by DEQ (DEQ 1998). From the 10 borings completed during 2014, 63 samples representing 512 feet were collected. Fourteen of these samples, equating to 214.5 feet, exhibited concentrations or characteristics exceeding "suspect levels" for surface (root zone) reclamation use (Aqua Terra Consultants, Inc. 2015b) as defined by DEQ (DEQ 1998). About one third of these exceedances were based on textural qualities, with the remaining exceedances attributed to pH, selenium, molybdenum, and/or acid base potential.

From the four historic borings, all had intervals less than 100 feet deep that exceeded a suspect level for one or more of the following parameters: pH, texture, sodium adsorption ratio (SAR), and/or molybdenum. Acid base potential data were not available for these historic borings.

Table 3.2-2. Summary of Site-Specific Characteristics of Rock Types Present in the AM5 Area

Rock Type	Physical Characteristics	Geochemical Characteristics
Alluvium	Deposits consisting of mixtures of sand, silt and clay, generally less than 30-feet thick but up to 50-feet thick at Young's Creek. Fine-grained deposits overlying coarse-grained deposits. Typically moderate infiltration rates.	Moderately- to strongly-alkaline, low SAR, low EC, low concentrations of metals
Colluvium	Found at valley margins overlying and interfingered with alluvium. Heterogeneous mixtures of clay, silt, sand and rock fragments.	Strongly alkaline and non-saline to slightly saline
Scoria	Also referred to as clinker. Abundant in uplands of AM5 area. Hard and/or brittle. Extremely high infiltration rate makes scoria an important source of groundwater recharge.	High molybdenum detected in one sample

Table 3.2-2. Summary of Site-Specific Characteristics of Rock Types Present in the AM5 Area

Rock Type	Physical Characteristics	Geochemical Characteristics
Clay/ Claystone	Common throughout AM5 area. Clays are easily eroded. May also contain sand and/or silt. Low infiltration rates. Texture is generally undesirable for plant growth.	High pH, selenium, and molybdenum.
Shale	Common, moderately lithified, predominantly clay-sized particles. Low to moderate infiltration rates. Poor suitability for plant growth.	Potentially high in selenium.
Sandstone	Fine- to very-fine grained. Hard, forms cap rock on buttes, ridges and highlands. Moderate to high infiltration rate.	pH elevated near the surface; potentially high selenium.
Siltstone	Hard, thinly bedded. Infiltration rate is low but moderate where fractured. Texture unsuitable for plant growth.	Elevated pH, SAR.
Coal	Moderate water infiltration rates where fractured or oxidized. Very poor medium for plant growth.	Elevated SAR and negative (acidic) acid-base potential
SAR – sodium adsorption ratio		
EC – electrical conductivity		

Source: Appendix N, Aqua Terra Consultants, Inc. (2015b)

3.2.2.4 Sensitivity to Compaction

Concerns about the compaction of alluvial aquifers in the Squirrel Creek, Dry Creek, Youngs Creek, and Little Youngs Creek valleys led to SCM commissioning a geotechnical analysis, which is included in the AM5 application as Appendix H of the Probable Hydrologic Consequences report (Nicklin Earth and Water 2017). This analysis concluded the following:

- In the alluvial valleys, the capability for transmitting groundwater is greatest in the sand and gravel strata typically found beneath clay-rich strata.
- Fat clay soils, when saturated, have a low bearing capacity and are most susceptible to settlement, whereas sandy soils are not significantly impacted.
- A swell-settlement test on a fat clay soil from boring B-3 in the Youngs Creek valley suggested the fully-loaded sample would lose 9.6 percent of its porosity at full load and experience a residual reduction in porosity of 5.3 percent after being unloaded. This test did not account for the mitigating effect of a geotextile fabric.
- Sandy soils were estimated to have bearing pressures of 10 to 30 tons per square foot. The thickest section of fill atop a sandy soil was estimated to have a bearing pressure of 4.9 tons per square foot, well below the range of acceptable bearing pressures.
- Dry Creek will have a 92-foot fill depth, over lean sandy clay alluvium.

3.2.2.5 Mineral Development Potential

Potential coal, oil, gas, and aggregate resources are present in the AM5 area. The potential for development of these resources is discussed within this sub-section.

As noted in Section 3.2.2, coal-bed methane production was widespread in the AM5 permit area and surrounding areas until the late 2000s, and only ceased when natural gas prices no longer supported local coal-bed methane production (Kuzara et al. 2016). Additionally, oil production has historically occurred from the Shannon Sandstone Member of the Cody Shale in the Ash Creek and Ash Creek South oil fields, located about 3.5 miles southwest of the AM5 area. Oil and gas exploration drilling has extended into the immediate AM5 area as recently as 2006, although no oil or gas production is known to have taken place within or proximal to the AM5 area (Aqua Terra Consultants, Inc. 2017).

The potential for aggregate (sand and gravel) production exists within the AM5 area, although the deposits present are not particularly unique to the area and as a rule do not appear to exhibit high-value characteristics. For example, fluvial sand and gravel in stream valleys is commonly overlain by tens of feet of fine-grained overburden, and scoria associated with shallow coal beds is less durable and present only as thin deposits. The most attractive scoria development targets in the AM5 area are burned sections of the Anderson Dietz seam.

Haul road development activities in the AM5 area would be likely to intercept the Roland, Smith, and other coal beds stratigraphically above the Anderson Dietz seam. These upper coal beds are generally understood to have low heating values and high ash contents compared to the Anderson Dietz seam. SCM's approved coal recovery plan does not require salvaging any coal above the Anderson Dietz seam, and no other large-scale mines in the area salvage these coals (Aqua Terra Consultants, Inc. 2017). Thus, there is a low development potential for the shallow coal seams in the AM5 area.

3.2.3 Environmental Consequences

This sub-section presents environmental consequences associated with the Proposed Action and other alternatives. Consequences unique to each alternative are discussed under separate headings.

3.2.3.1 No Action Alternative

Under the No Action Alternative, there will be no impacts to geology in the AM5 area. No large-scale cut and fill activities would take place, leaving geologic material of the AM5 area in place. Thus, there would be essentially no alteration to the appearance, physical characteristics, or geochemistry of rock units in the area. However, in the absence of a transportation corridor bisecting the AM5 area, it may be more likely that development of the coal-bed methane resource in the AM5 area could re-start if natural gas market conditions improve.

3.2.3.2 Proposed Action Alternative

Under the Proposed Action Alternative, approximately 6.5 million cubic yards of material will be removed from cuts in the AM5 area and used as fill for the haul road bed (Ackerman 2017f). Aside from the surficial soils that would be moved during this cut and fill process, the majority of displaced material would be geologic in nature. Thus, primary impacts to geology are related to the removal of large volumes of rock to use as fill material, and the replacement of this rock during reclamation with the fill mixture, which will have different physical and chemical characteristics compared to the original rock. Significant impacts to mineral resources are not anticipated because the disturbed material does not contain significant economic or unique mineral deposits.

The Proposed Action would involve the displacement of large volumes of bedrock by blasting, ripping, and scraping with heavy equipment. The primary rock units listed in **Tables 3.2.1 and 3.2.2** which are expected to be impacted include clinker, claystone, shale, sandstone, siltstone, and coal of the Wasatch Formation. The Fort Union Formation is far less prevalent at the surface in the AM5 area compared to the Wasatch Formation, so it will be affected to a much lesser extent. By nature of its association with stream valleys (which are slated to be filled), alluvium is generally not expected to be displaced by cuts.

The breaking down and displacement of in-situ geologic material resulting from the cut and fill process, followed by backfilling during reclamation, will result in changes to the appearance, physical characteristics, and chemical characteristics of the disturbed geologic units. Physically, areas that once consisted of relatively solid, contiguous bedrock will be void during operation of the haul road and backfilled with unconsolidated fill following reclamation. Chemically, previously buried zones of bedrock will be exposed to the atmosphere during operation of the road, and subsequently buried during reclamation using unconsolidated fill material with a potentially different chemical composition.

Chemical changes are addressed through strata quality sampling requirements under MSUMRA. Based on the 10 new strata quality borings completed in 2014 for the AM5 baseline, the AM5 application states that there is "little potential for releases of toxic or acidic conditions associated with the proposed AHA [AM5] activities" (p. 12; Aqua Terra Consultants, Inc. 2015b). It is noted, however, that in some cases, borings near deep cuts indicate intervals of concern (e.g. boring OB-8 and Cut 444+14), and in other cases, relatively deep cuts do not have nearby strata quality borings of sufficient depth to characterize the quality of the deeper cut material (e.g. Cut 350+87).

Visually, topographic features defined by geology such as hilltops, valley walls, and cliff faces will be missing from cut areas during road operation. Some features, such as steep bedrock topography and sheer cliff faces, cannot be directly replicated by reclamation.

3.2.3.3 Agency Modified Alternative

The Agency Modified Alternative does not specifically address geology and minerals so all impacts described previously under the Proposed Action (see Section 3.2.3.2) would be expected to persist.

3.3 Soils and Reclamation

The baseline study methods and results for the Proposed Action are described in the following sections. The regulatory framework for federal and state requirements are identified. Soils information was obtained from soil studies conducted during the 2014 field season. The baseline studies were completed for both Soils and Vegetation (Spring Creek Coal, LLC) (Westech Environmental Services Inc, 2015). Supplemental information was provided by the Natural Resources Conservation Service (NRCS) for soils within the AM5 permit area (USDA, 2012).

Federal Requirements

SMCRA outlines the minimum federal coal-mining requirements to restore land to a condition capable of supporting a use equal to or greater than the preexisting land use. Under Section 1273(c) of SMCRA, a state with a permanent regulatory program approved by the DOI Secretary, such as DEQ, can elect to enter into a cooperative agreement for state regulation of surface coal-mining and reclamation operations on federal lands within the state. OSMRE granted DEQ this authority, and DEQ regulates permitting and operation of surface coal mines on federal lands within Montana under the authority of MSUMRA, Section 82-4-221, MCA.

State Requirements

Montana meets SMCRA requirements for soil handling at coal mines. Surface-mining operations are required by MSUMRA (82-4-231 and 232, MCA) and its implementing rules (ARM 17.24.701 and 702) to remove all topsoil and subsoil suitable for reclamation, to immediately replace or temporarily store and protect the soil resource during mining, and to replace soil following mining to support revegetation. **Table 3.3.1** summarizes the applicable rules and regulations.

Table 3.3-1. Applicable Soil Rules and Regulations.

ARM 17.24 Subchapter	Summary of Requirement
Applicable Rules and Regulations under the Administrative Rules of Montana	
3	Contains requirements of the surface mine permit application, including gathering soil baseline information (ARM 17.24.304 and 306), requirements of the reclamation plan (ARM 17.24.313), special application requirements for prime farmlands (ARM 17.24.324), and special use requirements for coal-mining operations on or adjacent to areas including alluvial valley floors (ARM 17.24.325)
5	Contains backfilling and grading requirements
6	Lists performance standards for drainage reclamation (ARM 17.24.634) and sediment-control measures (ARM 17.24.638)
7	Includes the requirements of soil removal (ARM 17.24.701); soil stockpiling and redistribution (ARM 17.24.702); soil-stabilizing practices (ARM 17.24.714); use of soil amendments, management techniques, and land use practices (ARM 17.24.718); establishment of vegetation (ARM 17.24.711); soil/spoil monitoring plan (ARM 17.24.723); postmining land use (ARM 17.24.762); and cropland reclamation (ARM 17.24.764)
8	Contains reclamation and preservation requirements for prime farmland and alluvial valley floors
Applicable Rules and Regulations under Montana Strip and Underground Mine Reclamation Act	
MCA 82-4-2 Subpart	**Summary of Requirement**
222	Contains requirements of a mine permit application, which include a plan for the mining, reclamation, revegetation, and rehabilitation of land and water to be affected by the operation.
231	Requires submission of and action on a reclamation plan to include a plan of grading, backfilling, highwall reduction, topsoiling and reclamation for the area of land affected by the operation.
232	Contains specifications for soil removal, storage, replacement, and reconstruction on prime farmlands and non-prime farmlands.
233	Contains requirements for planting of vegetation following grading of disturbed area.

DEQ has outlined its procedures and methods to protect the soil resources that would be disturbed by coal-mining operations and to enhance the potential of achieving successful reclamation in its Soil, Overburden, and Re-graded Spoil Guidelines which would apply to the AM5 amendment (DEQ 1998). These guidelines are based on the requirements and objectives of MSUMRA and its implementing ARMs and include soil-suitability criteria for determining salvage depths and volumes of suitable soil and soil materials for use as a plant-growth medium.

Local Requirements

There are no applicable local regulations within or near the analysis area.

3.3.1 Analysis Methods

Baseline soil investigation activities focused on the areas to be disturbed by the Proposed Action. The soil analysis area is the proposed transportation corridor permit amendment boundary. This footprint includes the proposed AM5 permit boundary and all disturbances associated with the haul road corridor such as cut and fill slopes, roads, stockpiles, utility corridors, and buffer areas surrounding the proposed disturbance.

The soil study and analysis was conducted in September 2014 and completed in 2015 (Westech Environmental Services Inc, 2015). An Order 2 baseline soils inventory within the AM5 permit area was prepared in accordance with the DEQ Soil, Overburden and Regraded Spoil Guidelines (DEQ, 1998) and procedures as outlined by the Soil Survey Manual (NRCS, 1993).

The primary objectives of an Order 2 soils survey are to:

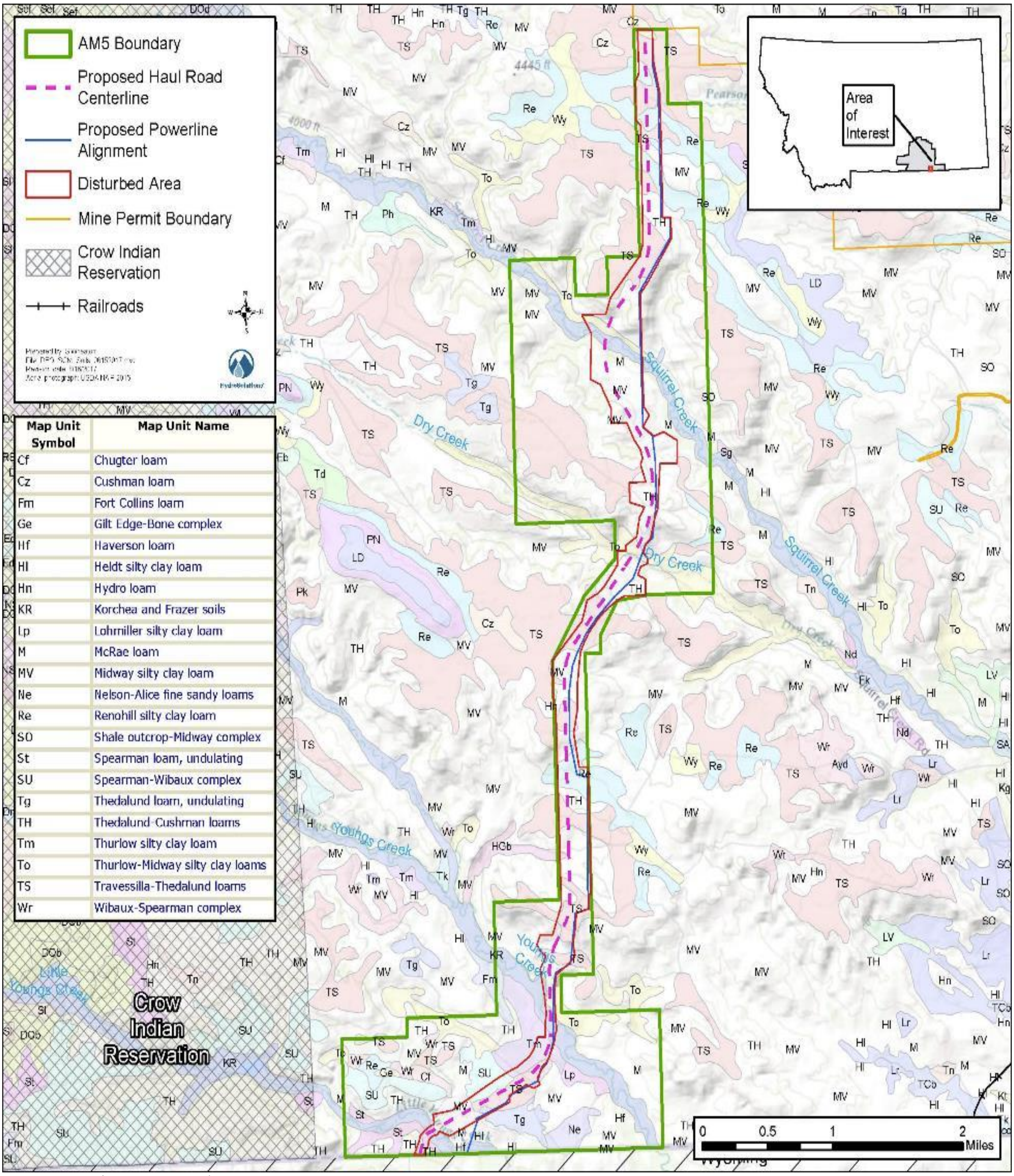
- Identify, delineate and classify dominant soils;
- Sample representative soil horizons from identified soils;
- Analyze soil samples for selected physical and chemical characteristics;
- Determine soil suitability for reclamation;
- Identify soils that may require special handling; and
- Assess the potential for Prime Farmland, in consultation with the Natural Resources Conservation Service (NRCS).

A detailed description of the field investigations methods and laboratory analysis is found in the project area baseline soil survey (Westech Environmental Services Inc, 2015). All soil disturbances would be confined to 968.96 acres within the AM5 permit area. The soil baseline study summarized existing NRCS soil survey data for soils within the AM5 permit area and evaluated these soils for use as plant growth media, drainage, and erodibility (Westech Environmental Services Inc, 2015). Soils were evaluated using data collected from the 2014 field study and published data obtained from the NRCS Web Soil Survey database (Westech Environmental Services Inc, 2015) (USDA, 2016). Soil samples collected from the Project area were analyzed and data are provided in the baseline soils report (Westech Environmental Services Inc, 2015).

3.3.2 Affected Environment

General Soil Types

Soils within AM5 permit area include moderately deep soils on upland plains and terraces surrounded by shallow soils on adjacent slopes and ridges. These soils typically formed in residuum and slope alluvium from sedimentary parent materials such as shale and siltstone. Information from the Big Horn Area Soil Survey (USDA, 2012) was used to identify dominant soil units found in the AM5 permit area. A soils map of the project area is provided in **Figure 3.3-1**.



Source: Westech Environmental Services Inc. 2015; USDA 2012.

Figure 3.3-1. Soils Map for the Area in the Vicinity of the Proposed Action.

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Data collected during the baseline soil survey were used to classify soils first to the family level and were then correlated to official soil series published by the NRCS (Westech Environmental Services Inc, 2015). The baseline soil survey yielded 23 families and 11 series that were included in the NRCS soil survey of Big Horn County, Montana (USDA, 2012).

A summary of the 11 soil series identified in the AM5 permit area is found in **Table 3.3-2**. A more detailed description of AM5 permit area soils, including specific soil chemistry and physical attributes, along with a more detailed breakdown of soil types and textures, is provided in the baseline soil survey (Westech Environmental Services Inc, 2015)**.** The following section presents each of the 11 identified series and generally describes their dominant characteristics, typical landscape position, and geography.

Table 3.3-2 summarizes the range of characteristics occurring in each soil series for depth class, slope, texture, coarse fragment content, pH, conductivity and sodium adsorption ratios (SAR).

Table 3.3-2. Primary Mapped Soil Series and Physical and Chemical Properties in the AM5 Permit Area

Depth Class[a]	Soil Series	Slope (%)	Textures[b]	Coarse Fragment (%)	pH	Conductivity (mmhos/cm)	SAR (%)
Very Shallow/ Shallow	Travessilla	3-10	L, SiL, CL, SiC	0-65	3.7 - 8.1	0.3 - 13.9	<0.1 - 14.7
Shallow	Midway	3-70	L, SiL, SCL, CL, SiC	5-60	3.7 - 8.0	0.3 - 13.9	<0.1 - 1.1
Moderately Deep	Cushman	3-10	SiCl, CL, SiC, SL, L	2-10	6.4 - 8.3	0.3 - 15.3	0.2 - 11.4
Moderately Deep	Renohill	0-10	L, SiL, SiCL, CL, Si, C, SiC	0-15	6.0 - 8.2	0.1 - 15.0	<0.1 - 5.2
Moderately Deep	Thedalund	0-10	L, SiL, SiCL, C	5-40	7.4 - 8.5	0.4 - 11.1	<0.1 - 10.0
Very Deep	Korchea	0-5	CL, SiCL, SiC	0	7.6 - 7.8	1.0 - 6.0	1.5 - 2.7
Very Deep	Lohmiller	3-10	L, CL, SCL	5-55	7.7 - 8.4	0.5 - 22.3	<0.1 - 13.7
Very Deep	McRae	0-5	L, SiL, CL, SiCL, SCL, L, C	5-55	6.9 - 8.2	0.3 - 13.4	<0.1 - 10.7
Very Deep	Spearman	0-5	L, SiL, SiCL,	5-10	7.2 - 7.9	0.5 - 0.8	0.4 - 0.5
Very Deep	Thurlow	0-10	L, SiL, CL, SiCL, SiC, C	0-40	6.2 - 8.3	0.3 - 13.8	<0.1 - 14.7
Very Deep	Wibaux	3-10	L, SiL	0 - 30	7.9 - 8.1	0.3 - 8.8	<0.1 - 4.2

[a.] Depth class/Depth to bedrock = Very Shallow 0-10 inches; Shallow 10-20 Inches; Moderately Deep 20-40 Inches; Deep 40-60 inches; Very Deep 60+ inches.
[b.] Texture Class = L-Loam; Si-Silt; SiL-Silt Loam; SiCL-Silty Clay Loam; SiC-Silty Clay; CL-Clay Loam; C-Clay
Source: Westech Environmental Services, Inc. 2015

A description of the primary 11 soil series identified from the baseline soil survey completed for the project area is provided below. Soil sample sites noted in the following descriptions correspond to surveys completed by Westech (2015).

Cushman

The Cushman series consists of well drained soils that are moderately deep to bedrock with moderate permeability, moderate infiltration, and medium runoff. These soils formed in slopewash alluvium and residuum from interbedded shales and siltstone and fine-grained argillaceous sandstone formed on buttes, fan remnants, hill, piedmonts, ridges and terraces (USDA, 2012b). Slopes range from three to ten percent, coarse fragment content ranges from two to ten percent and pH 6.4 to 8.3 throughout the soil profile. Primary uses of this soil are for native rangeland and wildlife habitat. Soil sample sites used to characterize the Cushman series are BK-14, BK-18 and CB-15.

Korchea

The Korchea series consists of very deep, well drained soils with moderate permeability, moderate infiltration, low to medium runoff and are rarely to commonly flooded. These soils formed in stratified alluvium located on flood plains and low stream terraces (USDA, 2012b). Slopes range from zero to five percent, coarse fragment content is zero percent and pH is 7.6 to 7.8 throughout the soil profile. Soils in this unit are suitable for cropland, pasture or native rangeland. Soil sample sites used to characterize the Korchea series include BK-02, BK-09 and BK-17.

Lohmiller

The Lohmiller series consists of very deep, well drained soils with slow to moderate permeability, moderate infiltration, and low to medium runoff depending on slope. These soils formed in calcareous alluvium derived from sedimentary rock. These soils occur on flood plains and high bottom lands of streams and on alluvial fans of foot slopes (USDA, 2012b). Slopes range from three to ten percent, coarse fragment content ranges from five to 55 percent and pH is 7.7 to 8.4. Primary uses of this soil are dryland crops and native rangeland. Soil sample site CB-14 was used to characterize the Lohmiller series.

McRae

McRae soils consist of very deep, well drained soils, with moderate permeability, moderate infiltration, and slow to medium runoff. These soils formed in calcareous loam alluvium from soils developed over sedimentary rocks. These soils occur on terraces of rivers and streams, alluvial fans in valleys, and footslopes in uplands (USDA, 2012b). Slopes range from zero to five percent, coarse fragment content ranges from 5 to 55 percent and pH is between 6.9 and 8.2. Primary use of these soils is for irrigated cropland or rangeland. Soil sample site CB-04 was used to characterize the McRae series.

Midway

Midway soils consist of shallow, well drained soils with very slow to slow permeability, slow infiltration, and low to very high runoff depending on slope. This soil type makes up over 40 percent of the soils present within the AM5 permit area (**Figure 3.3-2**). Soils formed in residuum and slope alluvium from calcareous platy, clayey shale. Midway soils are located on ridge crests, mesas, plains, and hills in shale bedrock uplands (USDA, 2012b). Slopes range from three to 70 percent, coarse fragment content ranges from five to 60 percent and pH is between 3.7 and 8.0. These soils are typically used for native range. Soil sample sites used to characterize the Midway series are BK-03, BK-15, BK- 20, BK-21, CB-02, CB-06, and CB-12.

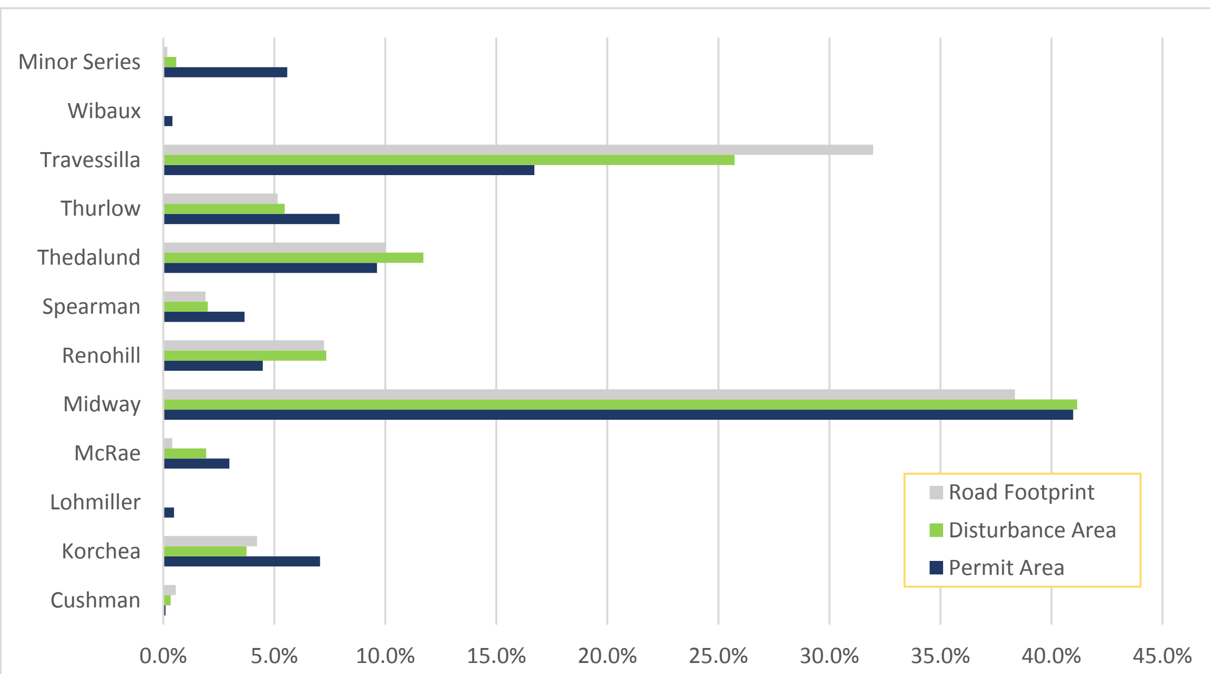

Figure 3.3-2. Relative percentage of soil series identified within the AM5 permit area, disturbance area, and road footprint (Westech 2015).

Renohill

Renohill soils consist of moderately deep, well drained soils with slow permeability, slow to moderate infiltration, and low to high runoff. These soils are formed in alluvium, colluvium and residuum located on bedrock-controlled plateaus, alluvial fans, hills and ridges with depth to bedrock ranges from 20 to 40 inches (USDA, 2012b). Slopes range from zero to ten percent, coarse fragment content ranges from zero to 15 percent and pH ranges between 6.0 and 8.2. This soil complex is suitable as rangeland and wildlife habitat with small areas cultivated for grains. Soil sample sites used to characterize the Renohill series are BK-11, BK-19, CB-10, CB-16 and CB-17.

Spearman

Spearman soils are very deep, well drained soils with moderate or moderately rapid permeability, moderate to rapid infiltration, and slow to medium runoff. These soils formed in loamy materials weathered from underlying hard red burned shale and are located on nearly level to rolling uplands (USDA, 2012b). Slopes range from zero to five percent, coarse fragment content ranges from five to ten percent and pH is between 7.2 and 7.9. This soil unit is used mainly as native range. Soil sample site used to characterize the Spearman series is BK-01.

Thedalund

Thedalund soils consist of moderately deep, well drained, moderately permeable soils with moderate infiltration and medium runoff. These soils are formed in thick calcareous alluvial materials derived from sedimentary rock on hills and ridges. (USDA, 2012b). Slopes range from zero to ten percent, coarse fragment content is between five and 40 percent and pH ranges from 7.4 to 8.5. These soils are used as native pastureland or as irrigated or dry cropland. Soil sample sites used to characterize the Thedalund series are BK-05, BK-10, CB-03, CB-07, CB-09 and CB-11.

Thurlow

Thurlow soils consist of very deep, well drained soils that are moderately permeable with moderate infiltration and low to moderate runoff. These soils formed in unconsolidated calcareous clay loam materials in valleys on river and stream terraces (USDA, 2012b). Slopes range from zero to ten percent, coarse fragment content is between zero and 40 percent, and pH ranges from 6.2 to 8.3. These soils are primarily used for irrigated and non-irrigated hay production. Soil sample sites used to characterize the Thurlow series are BK-04, BK-08, BK-13, CB-08, CB-13.

Travessilla

Travessilla soils consist of very shallow to shallow, well drained soils with moderate to moderately rapid permeability, moderate to rapid infiltration, and runoff is low to very high, depending on slope. Travesilla soils make up just over 15 percent of the soils within the AM5 permit area, but cover over 30 percent of the area within the road footprint (**Figure 3.3-2**). These soils formed in calcareous eolian sediments and materials weathered from sandstone and occur on hills, cuestas, scarps and mesas (USDA, 2012b). Slopes range from three to ten percent. Coarse fragment content ranges between zero and 65 percent and pH ranges from 3.7 to 8.1. This soil component is primarily used as rangeland. Soil sample sites used to describe the Travessilla series are BK-06, BK-07, BK-16 and CB-05.

Wibaux

Wibaux soils are very deep, well to somewhat excessively drained soils with moderate to very rapid permeability, moderate infiltration, and medium runoff. These soils formed in colluvium and alluvium derived from hard, red colored burned shale located on hillslopes, knolls, and ridges (USDA, 2012b). Slopes range from three to ten percent. Coarse fragment content ranges from zero to 30 percent and pH is 7.9 to 8.1. This soil component is suitable for native rangeland. Soil sample site CB-01 was used to characterize the Wibaux series.

The 11 primary soil series identified from the baseline soil survey and described above make up almost 95 percent of the soil series in the AM5 permit area. A graph showing the relationship of soil series with percent of surface area found in the AM5 permit area is provided in **Figure 3.3-2**.

Of the 11 soils series, the Travessilla and Midway series are the dominant soils located in the AM5 permit area, covering over 50 percent of the area. The remaining 9 soil series make up the remaining soils found in the permit area, disturbed area, and road footprint.

Soil Erodibility

Soil erodibility was assessed using soil survey data (USDA, 2016) and using procedures described in the National Soil Survey Handbook (USDA, 2017) (Westech Environmental Services Inc, 2015). All survey data, engineering properties, RULES2 related attributes, and wind erosions related attributes were evaluated to assess soil erodibility. The soil erodibility factor (Kf) indicates the susceptibility of the soil material less than 2 millimeters in size (fine earth) to sheet and rill erosion by rainfall; therefore, rocks and rock fragments in the soil profile are not considered in the evaluation. Values for K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by rainfall.

The assessment indicated soil with a low or medium degree of water erodibility (< 0.40 Kf). Overall, surface runoff class ranged from low to moderate, depending on the combination of soil texture (sand, silt, and clay), soil erodibility factor (Kf), and slope at the specific location.

Wind erodibility was evaluated based on soil composition. Other influences affect wind erosion and include water moisture and frozen soils. Wind erosion is highest for sandy loam texture in the A-horizon and less than 15 percent coarse fragment content. Wind erodibility was lowest for loam surface textures and greater than 35 percent coarse fragments (USDA, 2017). Based on the texture of silty clay loams with limited coarse fragments as indicated in the engineering properties evaluated by the NRCS, the mapped units have loam surface textures with limited coarse fragments indicating limited wind erosion potential with the exception of shallow, high coarse fragment Midway soils located on steep slopes (USDA, 2016).

Suitability for Reclamation

The soils investigation results described above identified the general depths of suitable soil for salvage and use as the vegetative growth substrate in reclamation. A map of soil-type location and salvage depths is provided in the AM5 application (Spring Creek Coal, LLC., 2015). The suitability of the soils located in the AM5 permit area for reclamation, as outlined in the baseline soils study, is described below and summarized in previous **Table 3.3-1**.

Physical Properties

Soil physical properties indicate a soils mineral composition and how the material may interact with water and the measured chemical characteristics. Physical properties can create complications in the reclaimed surface and are measured to avoid salvaging soils that contain extreme properties of saturation percent, texture, or rock fragment content. Slope and organic matter are not used to exclude a soil from salvage; however, they are useful for planning salvage strategy.

Saturation percentage indicates water retention and can be looked at with the chemical properties to determine a soil's tendency toward unsuitability. Textural classes can indicate water availability problems that might occur during the wet or dry season. Rock fragment content will limit plant growth; however, it could be good for shrubs by reducing competition with cool season grasses.

The physical properties of soil in the analysis area were considered suitable. A few unsuitable textures or rock contents were recorded. During salvage, reapplication and seedbed preparation, soil lifts mix together homogenizing soil material generally reducing problematic physical properties.

Chemical Properties

Chemical properties of pH, SAR, and EC indicate soil chemical reactivity whereas elements like boron (B), selenium (Se), and molybdenum (Mo) are actual chemical constituents. All of these have been determined to have ranges or concentrations that are problematic to reclamation.

Soils analysis showed that there are materials present with pH, SAR, or EC levels considered unsuitable. Much of this material is found lower in the soil profile than typical salvage depths. These soil chemical properties in the project analysis were determined to be minimal and are not expected to be problematic.

The chemical constituents of B, Se, and Mo were only identified in localized areas. Boron was found below the typical soil salvage depth. Selenium was identified in soils and geologic units near Dry Creek and Squirrel Creek drainages. SCM is committed to include Se sampling in this region through the permitting process. Molybdenum was not found unsuitable in any sample.

Suitability Conclusion

The soil suitability is consistent with the regional soils for use as redistributed soils during project reclamation. Historically managing these unsuitable soils through mixing that occurs during soil salvage and redistribution has proven effective. To ensure this process is successful, SCM conducts additional soil sampling and laboratory analysis prior to soil stripping. Where an unsuitable parameter is identified as too extensive for dilution through mixing, the soil salvage plan is adjusted (Spring Creek Coal, LLC., 2015).

Soil Redistribution Protocol

SCM grades spoils to the approved post mine topography (PMT) following mining. Prior to soil laydown, the spoil surface is tested for suitability on a 170-foot-square grid, about 1.5 samples per acre. The spoil samples are submitted to an independent lab for analysis. The protocol for soil redistribution is described in detail in the mine reclamation plan (Spring Creek Mine, 2017).

Prime Farmland

A Prime Farmland determination was conducted in collaboration with the NRCS office in Miles City, Montana (Westech Environmental Services Inc, 2015). The NRCS was provided with a soils map, as well as a description of land uses in the Study Area.

A total of 969.7 acres of land is present within the boundary of the transportation corridor. This acreage includes 58.5 acres of Prime Farmland if Irrigated and 117.7 acres of Farmland of Statewide Importance, as mapped by the NRCS (USDA, 2016). These soils are considered potential Prime Farmland soils since both cultivation and irrigation are required to meet the NRCS Prime Farmland criteria. Potential Prime Farmland soils within the boundary of the transportation corridor include Korchea and Thurlow.

3.3.3 Environmental Consequences

3.3.3.1 No Action Alternative

Under the No Action Alternative, the AM5 haul road would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Montana-Wyoming border to the SCM. Therefore, no direct effects to soils in the AM5 area would occur under the No Action Alternative.

3.3.3.2 Proposed Action Alternative

Under the Proposed Action Alternative, the disturbance area is estimated to be 970 acres, with just over 300 of those acres stemming from the haul road and berms along a nine-mile AM5 corridor. Roadside fill-slopes would be regenerated naturally or seeded with a native weed-free seed mix, as determined appropriate. Soil would be stockpiled for use in final reclamation. At the completion of mining activities, culverts would be removed and the disturbed areas reclaimed and revegetated with native species.

Short-term effects to the soil resource from the construction of the haul road system would consist of approximately 970 acres of land temporarily removed from the productive soil base and converted for use as part of the AM5 road until such time that ore hauling activities are completed and reclaimed/revegetated. Effects to the soil resource due to the construction of the roadway and berms within the AM5 corridor would consist of displacement and mixing of soil horizons; these effects would be temporary as reductions in productivity are expected to be regained over time.

Revegetation of disturbed areas created during the construction and reclamation phases should occur within three years ensuring long-term soil stability and recovery in both the pullout and culvert replacement locations. Project related mitigation and monitoring through the requirements of SMCRA, MSUMRA, and the Montana Storm Water Permits ensure that the reclamation of disturbed areas would be monitored to ensure that natural revegetation occurs. If the areas are not revegetated naturally, they would be seeded with a native seed mix and monitored for revegetation success. Overall, the primary impacts from the Proposed Action would be moderate, short term, and local.

3.3.3.3 Agency Modified Alternative

The AMA includes additional mitigations listed in Section 2.4.1 above. Several mitigations could affect soils and reclamation. First, keeping construction equipment out of wetland, riparian, and saturated areas or timing construction activities when the ground is frozen would minimize soil compaction and sediment transport. Secondly, the reduction in soil compaction would reduce impacts by enhancing the revegetation process which would promote stability. Third, keeping equipment out of fragile soil areas would also reduce the potential for erosion of soils. Similarly, the construction or removal of culverts during low or no flow periods would reduce erosion of the soils.

There are no other mitigations specifically targeting soils and reclamation. All other aspects of the Proposed Action would persist including potential impacts by temporarily removing productive soil base and displacement and mixing of soil horizons.

Project related mitigation and monitoring through the requirements of SMCRA, MSUMRA, and the Montana Storm Water Permits would ensure that the reclamation of disturbed areas would be monitored to ensure that revegetation occurs to stabilize soils. Disturbed areas would be seeded with a native seed mix and monitored for revegetation success.

3.4 Ground and Surface Water Resources

This section describes the affected surface water and groundwater environments in detail and then presents a discussion of primary impacts to surface water and groundwater resources in the AM5 area for the proposed alternatives. The regulatory framework for water resources in Montana includes:

- The Federal Clean Water Act
- The Montana Water Quality Act (75-5-101, *et seq*., MCA)
- Nondegradation Rules (17.30.701 et seq., ARM)
- Montana Surface and Underground Mine Reclamation Act (82-4-201 et. seq., MCA)
- Montana Pollutant Discharge Elimination System (MPDES)
- Montana Nonpoint Source Management Plan

The Federal Clean Water Act provides for the maintenance and restoration of the physical, chemical and biological integrity of the Nation's water (33 USC 1251 et seq.). The EPA delegated most of the implementation of the Clean Water Act (CWA) to the State of Montana. Designated beneficial uses of Montana's state waters include recreation, water supply, fisheries, aquatic life, and wildlife. The CWA requires that the State of Montana establish priority ranking for waters on the Section 303(d) list of impaired waters and to develop Total Maximum Daily Loads (TMDLs) for these waters. TMDLs are one of many tools in the CWA to help achieve the Act's main objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." (CWA section 101(a)). Montana regulations (MCA 75-5-703(3)) require that "all necessary TMDLs" be completed for water bodies on the 1996 303(d) list.

Section 303(d) of the CWA requires the listing of impaired water bodies and outlines a program for addressing water body segments with impairments that preclude them from meeting standards designated for beneficial uses. These impairments to water quality include both point and non-point sources. DEQ is the lead agency for development of Water Quality Plans and TMDLs for 303(d)-listed water bodies.

The CWA regulates discharge of dredged or fill material into any water of the U.S., including wetlands (33 USC 1344) and provides the regulatory framework for assessing impacts to water quality. Section 404(b)(1) guidelines prohibit discharges of dredged or fill material into waters of the United States, including wetlands, if a practicable alternative to the proposed discharge exists that would have less adverse impacts on the aquatic ecosystem (provided that the alternative does not cause other significant adverse environmental impacts) (40 CFR 230(a)).

The reclamation bond that a mine operation must submit before DEQ issues a permit or approves a permit amendment must be sufficient to ensure compliance with the Montana Water Quality Act (WQA). The WQA provides a regulatory framework for protecting, maintaining, restoring and improving the quality of water for beneficial uses. Pursuant to the WQA, DEQ has developed water quality classifications and standards, as well as a permit system to control discharges into state waters. Mining operations must comply with Montana's regulations and standards for surface water and groundwater. The WQA requires DEQ to protect high-quality state water from degradation. The nondegradation rules (17.30.701 et seq., ARM) were adopted to implement the Act. The nondegradation rules apply to activities which may significantly affect the quality of surface or groundwater (ARM 17.30.715). Some of the more pertinent rules and regulations related to surface and groundwater resources are briefly summarized in **Table 3.4-1**.

Table 3.4-1. Applicable Rules and Regulations Related to Hydrology, Water Quality, and Water Quantity.

Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 17.24 Subchapter	**Summary of Requirement**
3	Contains requirements of the surface mine permit application, including gathering hydrology baseline information (ARM 17.24.314), requirements of the reclamation plan (ARM 17.24.313), requirements for coal-mining operations on or adjacent to areas including alluvial valley floors (ARM 17.24.325)
6	Lists performance standards for water quality (ARM 17.24.633) drainage reclamation (ARM 17.24.634), sediment control structures (ARM 17.24.635), diversions (ARM 17.24.636 and 637), sediment-control measures (ARM 17.24.638), groundwater protection (ARM 17.24.643 and 644), ground and surface water monitoring (ARM 17.24.645 and 646), and water rights (ARM 17.24.648).
8	Contains reclamation and preservation requirements for essential hydrologic functions near prime farmland and alluvial valley floors.

Table 3.4-1. Applicable Rules and Regulations Related to Hydrology, Water Quality, and Water Quantity.	
Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 17.24 Subchapter	**Summary of Requirement**
18	Addresses nondegredation of water quality.
ARM 17.30 Subchapter	**Summary of Requirement**
1	Relates to the 401 water quality certification determination by DEQ prior to issuance of the 404 permit to construct the haul road.
7	Nondegradation of water quality
Applicable Rules and Regulations under Montana Strip and Underground Mine Reclamation Act	
82-4-2 Subpart MCA	**Summary of Requirement**
222	Contains requirements of a mine permit application, which include a plan for the mining, reclamation, revegetation, and rehabilitation of land and water to be affected by the operation.
227	Assures that the project has been designed not to damage the hydrologic balance outside of the permit area.
231	Requires submission of and action on a reclamation plan to include a plan for minimizing disturbances to the hydrologic balance, water quality, and quantity and reclamation for the area of land affected by the operation. Includes containment of sediment using siltation structures and addresses restoration of groundwater recharge areas.
232	Related to bond release, returning lands to prior uses, and assessment of potential for pollution

3.4.1 Analysis Methods
The primary sources of data for this section were provided in the AM5 application (Spring Creek Coal, LLC. 2015), including: Appendix I Volume 5, Pre-mine Hydrology for Arrowhead Amendment (Aqua Terra Consultants, Inc. 2017); Appendix O4, Alluvial Valley Floor Assessment (Aqua Terra Consultants, Inc. 2015a); and Appendix L, Probable Hydrologic Consequences Update (Nicklin Earth and Water 2017). Additional data sources included the Decker Area Groundwater Cumulative Hydrologic Impact Assessment (DEQ, ND) and various scientific reports on the area by the U.S. Geological Survey and other sources, which are cited in the text.

3.4.2 Affected Environment
This section presents an overview of water resources in the general area of the Project, followed by more detailed discussions of surface water and groundwater resources within the AM5 area. The AM5 area is located in the Upper Tongue River subbasin, hydrologic unit code (HUC) 10090101. The Upper Tongue River subbasin originates from headwaters in the northern Bighorn Mountains in Wyoming, flowing in a northeastern direction toward Birney, Montana near the confluence with Hanging

Woman Creek and covers 2,534.1 square miles. (**Figure 3.4-1**). Surface water flow from the Tongue River Basin (HUC 100901) is tributary to the Yellowstone River at a confluence near Miles City, Montana. The hydrologic Tongue River Basin falls within the Powder River Basin geologic structural basin.

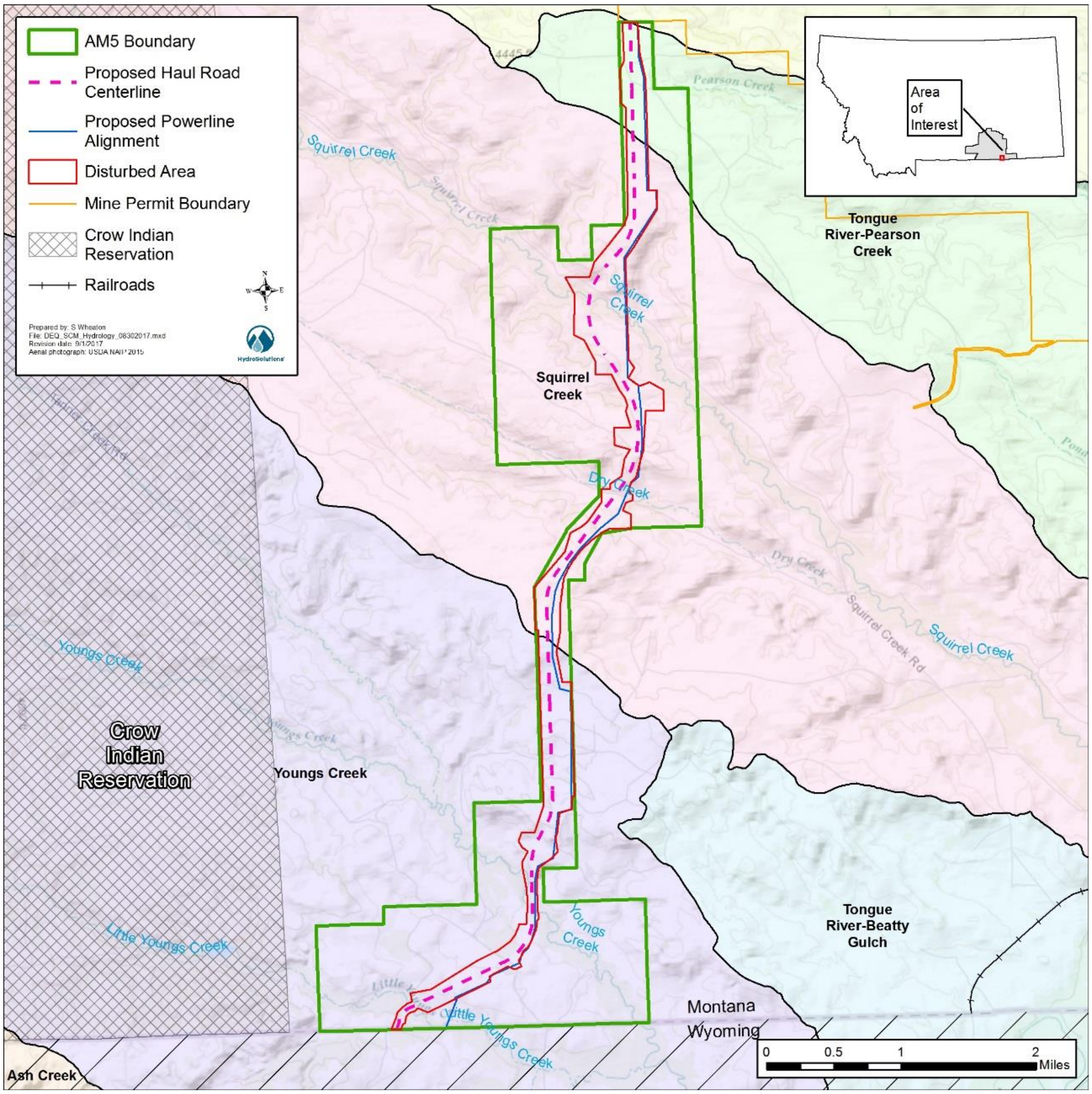

Figure 3.4-1. Map of Hydrologic Subbasins in the Near the Spring Creek Mine AM5 Area.

In the northern Powder River Basin, water resources are primarily used for agricultural irrigation, stock watering, industrial use, and domestic use (Slagle 1983; Aqua Terra Consultants, Inc. 2017). Of these uses, agricultural irrigation has historically been the dominant water use (Slagle 1983).

Past energy production projects have also affected water resources in the northern Powder River Basin. Large-scale surface coal mine development that began in the 1970s removed portions of stream channels as well as coal and overburden aquifers, and has also led to localized groundwater drawdown due to dewatering activities at SCM and the East and West Decker Mines (Spring Creek Coal LLC 2015) (DEQ, ND). Also, from the late 1990s to the late 2000s, coal-bed methane production resulted in the extraction and surface discharge of large quantities of groundwater from Fort Union Formation coal aquifers, which led to notable regional groundwater drawdown and surface water quality concerns. However, in recent years, coal-bed methane production in the project area has been negligible and water levels in the affected aquifers appear to be recovering (Kuzara et al. 2016).

Surface water in the AM5 area is drained by several tributaries of the Tongue River, which have incised steep-walled valleys into the rolling upland topography of the area. Stream flow in the area is seasonal and associated with precipitation, with peak flows occurring during early spring and early summer in response to snowmelt, as well as sporadically in response to rainfall events (Slagle 1983). About seven miles east of the AM5 area, the Tongue River Dam forms a 79,071-acre-foot storage reservoir on the Tongue River. The reservoir is used for storage of irrigation, industrial, Northern Cheyenne Tribe reserved water rights, and fish hatchery water and is also a popular recreation site (DNRC 2014).

Groundwater in the area occurs in relatively shallow local flow systems (less than 200 feet deep) as well as in deeper regional systems. The shallow flow system comprises alluvial aquifers and coal, clinker, and sandstone aquifers of the Wasatch Formation and the upper Tongue River Member of the Fort Union Formation (Kuzara et al. 2016; Slagle et al. 1985). Recharge to the shallow groundwater system comes from infiltration of precipitation into clinker-capped ridges and outcrops and locally from infiltration of stream flow, particularly during times of runoff. Flow in shallow aquifers tends to follow topography, primarily discharging to alluvial aquifers and springs in stream valleys, or to the deeper regional flow system (Slagle et al. 1985).

The deeper, regional flow system typically occurs at depths greater than 200 feet below ground surface and consists of coal and sandstone aquifers in the Fort Union Formation and underlying formations. Unlike the shallow groundwater system, these deeper aquifers primarily receive recharge from distant outcrops around the margins of the Powder River Basin. Some recharge may come from the overlying local groundwater system, although the prevalence of low-permeability shale strata in the Tongue River Member suggests that vertical seepage is limited (Kuzara et al. 2016).

The deep regional groundwater system generally flows north, eventually joining the Yellowstone River, with discharge occurring to springs and streams, or leaving the basin as deep groundwater flow (Kuzara et al. 2016; Slagle et al. 1985). The remaining discussion of groundwater resources in this EIS will focus on the shallow groundwater system, because the nature of the alternatives dictates that any impacts will be focused within this upper groundwater system.

3.4.2.1 Surface Water

As the AM5 corridor traverses the landscape from SCM to the Wyoming border, it crosses the watercourses and subwatersheds (drainage areas associated with small streams) of four generally southeast flowing tributaries of the Tongue River, namely Squirrel Creek, Dry Creek, Youngs Creek, and Little Youngs Creek (**Figure 3.4-1**). Additionally, the northernmost extent of the AM5 corridor overlaps approximately 265 acres of the Pearson Creek drainage basin but does not cross Pearson Creek itself. Except for Pearson Creek, these streams all have headwaters in the Wolf Mountains on the Crow Indian Reservation, west of the AM5 area. Surface water resources in these drainage basins are generally undeveloped, apart from on-stream stock reservoirs present on many tributary channels, and historic small-scale channel modifications in some locations (Aqua Terra Consultants, Inc. 2017).

Streamflow and Physical Characteristics

Squirrel Creek, Youngs Creek, and Little Youngs Creek are classified as intermittent or perennial streams, discharging several months of the year, whereas Dry Creek is classified as an ephemeral stream, reportedly flowing only rarely and in direct response to precipitation. Discharge in these streams is variable but generally peaks during spring runoff with other short increases following significant precipitation events. Base flow in the perennial streams ranges from nearly zero to around three cubic feet per second (cfs) (Nicklin Earth and Water 2017). A summary of watershed characteristics submitted with the AM5 application is presented in **Table 3.4-2**, and a summary of perennial stream flow and discharge is presented in **Table 3.4-3.**

Table 3.4-2. AM5 Area Subwatershed Characteristics

	Youngs Creek at State Line	Youngs Creek at Mouth	Little Youngs Creek at Mouth	Dry Creek at Mouth	Squirrel Creek at Mouth
Drainage Area (sq. mi.)	43.6	64.1	17.0	7.10	49.8
Average Annual Precip. (in.)	14.5	13.7	14.0	13.3	14.3
Average Annual Runoff (in.)	2.3	1.9	1.4		3.96
Mean Annual Discharge (cfs)	7.4	9.2	1.8		1.9
2-yr Peak Discharge (cfs)	39 - 198	42 - 208	18 - 88	75	185
5-yr Peak Discharge (cfs)	109 - 473	113 - 498	53 - 222	200	500
10-yr Peak Discharge (cfs)	173 - 756	184 - 791	85 - 364	300	740
25-yr Peak Discharge (cfs)	272 - 1232	286 - 1293	134 - 611	475	1270

Notes:

Data sources include Hedges et al. (1980), Thompson and Van Voast (1981) and Ferreira (1981).

Peak discharge rate ranges represent flow rates expected to occur within 65% confidence probability.

Peak discharge rates shown as single values represent mean values from prediction of 65% confidence interval.

The mean annual discharge value shown for Squirrel Creek is that which is expected to be equaled or exceeded 50% of the time.

Blank entries are shown where estimates are unavailable.

Source: Reproduced from Spring Creek Mine SMP C1979012 Appendix I Table I Vol. 5-1 (Spring Creek Coal, LLC 2015)

SCM presented longitudinal stream profiles in Exhibit O4-6.0 of the AM5 application. Typical gradients, summarized on **Table 3.4-4**, ranged from 0.25 to 1.25 percent, excepting Dry Creek, which was steeper. Irregularities along the channels resulted in local gradients of minus 5 to plus 12 percent (Spring Creek Coal LLC 2015; DEQ ND). The AM5 application attributes most of these irregularities to previous human impacts, including dams, channel diversions, and road crossings. Squirrel Creek has the most regular channel profile, whereas Dry Creek has the most irregular profile (Aqua Terra Consultants, Inc. 2017).

Table 3.4-3. AM5 Perennial Stream Flow Summary				
Stream	**Typical Base Flow (cfs)[a]**	**Highest Observed Mean Daily Flow (cfs)**	**Typical Monthly Discharge Volume (acre-feet)[b]**	**Notes**
Squirrel Creek	1–3	40	<10–250 [No data]	Losing stream between upstream and downstream gaging stations.
Youngs Creek	2.5–4	15–25	<10–450 [1,220]	Gaining 1.5–2 cfs between upstream and downstream gaging stations; however, losing conditions may also occur.
Little Youngs Creek	0.1–1	30	<10–250 [440]	Gaining between upstream and downstream gaging stations. Agricultural irrigation diversions likely affect measured flows.
a Aqua Terra Consultants, Inc., 2017 or estimated from graphs in Appendix I Figure I Vol. 5-2. b Estimated from graphs in Appendix I Figure I Vol. 5-3. Includes upper and lower stations where applicable. Maximum from 2011 shown in brackets.				

Source: Aqua Terra Consultants, Inc. 2017

Fields along both Youngs Creek and Little Youngs Creek are flood irrigated within the AM5 area using surface water diverted via ditches and reservoirs. There are no apparent irrigated fields on Squirrel Creek and Dry Creek within the AM5 area.

Table 3.4-4. Summary of Stream Channel Gradients		
Stream	**Typical Gradient (percent)**	**Note**
Squirrel Creek	0.37–1.11	Most regular profile of the four streams. Attributed to minimal historic development of stream.
Dry Creek	0–4.78	Short reach with gradient of -4.91 percent located just west of AM5 boundary. Most irregular profile, attributed to high degree of historic impoundments, juvenile geomorphic development, and presence of bedrock ledges.
Youngs Creek	0.26–0.92	Max gradient of 8.6 percent over 70-foot reach about midway through AM5 area.
Little Youngs Creek	0.71–1.24	Max gradient of 12 percent over 50-foot reach in western AM5 area.

Source: Spring Creek Mine SMP C1979012 Exhibit O4-6.0

Surface Water Quality

AM5 surface water quality data from streams, ponds, and springs are presented in the SCM AM5 application. Analytes included common ions, total and dissolved metals, and general parameters such as conductivity, turbidity, nitrogen, and phosphorous. Water in the streams crossing the AM5 area is typically magnesium bicarbonate type, with a measured total dissolved solids (TDS) ranging from 218 to 897 milligrams per liter (mg/L). At least one background sample from the streams exceeded a DEQ Circular

DEQ-7 aquatic life standard for the following parameters: electrical conductivity, dissolved aluminum, total cadmium, total copper, total lead, total nickel, total zinc, and total iron. Sodium adsorption ratio (SAR), a parameter linked to the suitability of water for irrigation, was in the safe range for irrigation in all samples that were evaluated.

Pond water quality exhibited a wide range of measured TDS values, ranging from less than 100 mg/L to almost 5,000 mg/L, with principal dissolved components consisting of sodium, magnesium, and sulfate. Total metals analyses in all stock reservoirs met the dissolved metals analyses livestock standards published on the Montana Groundwater Information Center (GWIC) website (MBMG 2017).

Total Maximum Daily Loads

The Upper Tongue River (HUC 10090101) is the receiving water for all of the streams in the AM5 area. The Upper Tongue River reach extends from the Wyoming border to the inlet of the Tongue River Reservoir. This segment of the Tongue River is classified as a B-2 stream, and is listed as not fully supporting aquatic life in the 2016 DEQ WQB Water Quality Analysis Report (**Table 3.4-5**) (CWAIC 2016a). B-2 streams are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

This segment of the Tongue River was added to the 303(d) list of impaired waterbodies in 1996 for flow alteration. To be protective, it will remain listed for flow alterations since there are numerous water diversions above the reservoir (CWAIC 2016a). It is also listed for iron since 7 of 53 samples taken between May 2001 and May 2006 exceeded the chronic criterion of 1,000 µg/L (CWAIC 2016a). No other metals exceeded the numeric standard in the same timeframe. Available nutrient data and moderate aquatic plant growth suggested no impairment due to nutrients (CWAIC 2016a).

Total Suspended Solids (TSS) concentrations ranged from 3- 697 mg/L with a mean of 53 mg/L for the entire period of record at the state line USGS gage. The Tongue River has naturally high TSS levels due to soils, geology, and topography although there are possible anthropogenic sources. More data analyses are required to determine the effect of natural versus anthropogenic sources (CWAIC 2016b). The possible causes of impairment include elevated iron levels and low flow alterations due to irrigated crop produciton, streambank modifications and flow regulation. Low flow and flow alteration are considered pollution and do not result in Total Maximum Daily Load (TMDL) development. A TMDL for iron has been identified as a need, but has not been completed (CWAIC 2016b).

Salinity (expressed as SC) and Sodium Adsorption Ratio (SAR) standards specifically for the Tongue River mainstem are set for the growing and non-growing season and include monthly average criteria as well as instantaneous maximum criteria.

There was a single maximum criteria exceedance (3000 µS/cm) in 2002, whereas all the monthly averages were below the numeric standard (CWAIC 2016a). Since the majority of the data correspond to the monthly averages, and no exceedances were found, EC is not considered an impairment. Sulfate concentrations ranged from 16- 302 mg/L with an average concentration of 116 mg/L at the state line USGS gage. Sulfates are generally a concern to agricultural uses because of the potential to increase stream salinity. Since salinity is not a problem in this segment, sulfates were not considered as a probable cause of impairment.

The four tributary streams that cross the AM5 area have not been assessed by the Montana WQB, but Squirrel Creek has been designated as a C-3 stream (CWAIC 2016b). C-3 streams are suitable for bathing, swimming, and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers. C-3 waters are naturally marginal for drinking, culinary, and food processing purposes, agriculture and industrial water supply.

Table 3.4-5. Summary of Montana Water Quality Information for Streams in the AM5 Area

Stream	Assessment Unit	Use Class	Impairments to Beneficial Uses	Potential Causes	TMDL Completed?
Squirrel Creek	MT42B002	C-3	Not Assessed		
Dry Creek	No unit designated		Not Assessed		
Youngs Creek	No unit designated		Not Assessed		
Little Youngs Creek	No unit designated		Not Assessed		
Upper Tongue River	MT42B001	B-2	Not fully supporting aquatic life	Iron Low flow conditions	No

3.4.2.2 Groundwater

General groundwater hydrogeology of the AM5 area and its surroundings was presented in Section 3.4.2. Further discussion will focus on the shallow local groundwater system, (less than about 200 feet deep), because the relatively isolated deeper regional system is unlikely to be affected by any of the proposed alternatives. In the vicinity of SCM and the AM5 area, groundwater is primarily used for domestic, livestock, and mine water supplies (DEQ ND).

Groundwater Occurrence

Readily accessible groundwater in the AM5 area is primarily sourced from alluvial aquifers along stream valleys, the Anderson Dietz (and deeper) coal seams, and thick beds of clinker. Coal bed methane development led to dewatering of the Anderson, Dietz, and other coal seams, reducing their reliability as a groundwater source, although water levels in these coal aquifers now appear to be recovering following a sharp decline in coal bed methane production (Kuzara et al. 2016).

Generally, recharge to shallow alluvial aquifers in the AM5 area is from stream losses, precipitation, runoff, flooding, agricultural irrigation activities, and discharge from bedrock aquifers. Saturated zones of bedrock in the uplands above alluvial valleys are thought to receive limited recharge, except where overlain by clinker. Discharge from saturated upland strata is typically in the form of slow seeps. A literature review of aquifer properties (aquifer test results) is provided in the AM5 application (Aqua Terra Consultants, Inc. 2017). Additional details of water-bearing units in the AM5 area are summarized in **Table 3.4-6**.

Table 3.4-6. Summary of Site-Specific Groundwater Occurrences

Location	Notes
Squirrel Creek alluvium	Water was detected in three of four shallow piezometers that were installed along Squirrel Creek. In the piezometers, groundwater depths ranged from about 5–10 feet below ground surface. Four fully-penetrating alluvial wells were also constructed, but groundwater has only been detected in one (downstream) well. In this well, the saturated thickness ranged from 15–19 feet, with depth to groundwater ranging from 14–18 feet below ground surface.
Dry Creek alluvium	Three wells fully penetrating the alluvium were constructed, two of which have been dry with the third exhibiting about 0.5–1 foot of saturated thickness. Limited occurrences of groundwater are presumed to mostly arise from rapid, direct recharge of precipitation, which is then lost to plant evapotranspiration and deep percolation.
Youngs Creek alluvium	35–60 feet saturated thickness, with about 3–5 feet of seasonal fluctuation. Evidence of both gaining and losing reaches of stream. Well yields reported to range from 5 to 80 gpm for Youngs and Little Youngs Creek alluvium.
Little Youngs Creek alluvium	Saturated thickness ranges from 5–25 feet for upstream wells, with water level changes of 15–20 feet between spring and summer. Downstream wells have thicker saturated thickness (20–40 feet) and exhibit less water level fluctuation. Data suggest stream is generally losing. Well yields reported to range from 5 to 80 gpm for Youngs and Little Youngs Creek alluvium.
Bedrock below alluvium and above Anderson-Dietz coal seam	Well completed in Smith coal was dry; groundwater detected in sandstone stratum below Smith.
Coal aquifers	These aquifers have historically been widely utilized for stock and domestic water supplies. Historic monitoring data indicate that water

Table 3.4-6. Summary of Site-Specific Groundwater Occurrences	
Location	**Notes**
	levels were generally in decline from 1977 through 2011. Recovery of heads in some wells (increasing water levels) ranging from about 30 to 200 feet were evident in 2014–2015 data, although generally heads (water levels) remain below historic elevations. Some observed fluctuation in water levels is attributed to methane content in the groundwater.

Source: Aqua Terra Consultants, Inc. (2017)

Groundwater Quality

Monitoring wells and piezometers were sampled quarterly for five quarters during 2014 and 2015 (Aqua Terra Consultants, Inc. 2017). Twenty wells and piezometers and four springs were selected for monitoring, and overall sampling completeness over the five quarters was 74 percent. In most cases where wells or springs were not sampled, a dry well or spring was the reported reason. With two exceptions, all wells were completed in valley floor alluvium. Generally, groundwater in the AM5 area is chemically classified as calcium bicarbonate or calcium sulfate type (Aqua Terra Consultants, Inc. 2017). Specific conductivity values and groundwater classifications based on this parameter (ARM 17.30.1006) are shown in **Table 3.4-7.**

Table 3.4-7. Summary of Groundwater Classification Based on Montana ARM 17.30.1006		
Unit	**Conductivity Range (µs/cm)[1]**	**Groundwater Class[2]**
Squirrel Creek alluvium	1,200–1,574	II
Dry Creek alluvium	2,870–3,420	III
Youngs Creek alluvium (shallow)	1,760–3,980	III
Youngs Creek alluvium (deep)	952–1,990	II
Little Youngs Creek alluvium	751–839	I
Bedrock (OB-11)	1,550–1700	II

ARM 17.30.1006 groundwater classifications are based on specific conductivity: Class I—up to 2,500 microSiemens/cm (µs/cm), Class II—1,000 to 2,500 µs/cm, Class III—2,500 to 15,000 µs/cm.

Notes: (1) Reported conductivity values are laboratory analyzed, (2) SCM based groundwater classification on mean specific conductance value.

Source: Aqua Terra Consultants, Inc. (2017)

Groundwater in the AM5 area is generally considered suitable for irrigation and livestock use, with the exception of groundwater from shallow alluvium along Youngs Creek and groundwater from Dry Creek alluvium. Groundwater from both of these sources naturally exceeded recommended thresholds for livestock and irrigation use. With respect to human health standards, no primary maximum contaminant levels (MCLs) were exceeded in any of the sampled wells, although secondary MCLs for iron, manganese and total dissolved solids were exceeded (Aqua Terra Consultants, Inc. 2017). Thus, some groundwater in the AM5 area could potentially be used as drinking water but would likely exhibit one or more undesirable characteristics due to secondary MCL exceedances.

3.4.2.3 Water Rights

SCM representatives conducted an inventory of water use in and around the AM5 area, including wells, springs, and water rights. A total of 18 groundwater rights were cataloged within the AM5 area, primarily with purposes of stock, domestic, and irrigation. SCM or entities owned by its corporate parent control all groundwater rights within the AM5 area, so no water rights owned by any other parties would be affected by development activities in the AM5 area (Aqua Terra Consultants, Inc. 2017). The AM5 application did not provide an evaluation of surface water rights.

3.4.3 Environmental Consequences

This sub-section presents environmental consequences associated with the Project alternatives. Consequences unique to each alternative are discussed under separate headings.

3.4.3.1 No Action Alternative

Under the No Action Alternative, there will be no impacts to water resources in the AM5 area. No large-scale cut and fill activities would take place, leaving stream channels in their natural states and rock units through which water may percolate in their natural condition.

3.4.3.2 Proposed Action Alternative

Implementation of the Proposed Action Alternative would be likely to have a moderate impact on surface water and groundwater resources. Potential impacts include changes to groundwater recharge and discharge patterns, chemical changes to groundwater, changes to stream channel hydraulics, increased sediment loading, long-term loss of stream sections which would be undergrounded to pass beneath the haul road, and changes to stream flow patterns.

Removal of native geologic material (cuts) followed by backfill with unconsolidated fill material of different composition during reclamation will change the physical and chemical composition of the unsaturated (vadose) zone and possibly the saturated zone in some areas. These impacts would be analogous to changes commonly observed following reclamation of strip mined pits with overburden spoil material. SCM notes that in general cuts are not expected to occur through saturated materials, which would potentially minimize many of these effects. Still, even in this case, localized groundwater recharge and discharge patterns and the chemistry of groundwater recharge may be altered.

Reduction or cessation of agricultural flood irrigation will reduce diversions from streams, potentially leaving more water in streams during the irrigation season.

However, cessation or modification of irrigation patterns may also alter historic stream flow patterns and may decrease late-season stream flows that were previously sourced from return flows. The compaction of the ground beneath the large fill areas proposed in the valley bottoms may also alter groundwater movement and cause longer saturation of soils on the uphill side of the fill. Even with geotextile inserts, the weight of 30 to 90 feet of fill is likely to decrease interstitial spaces in the soils between the original ground surface and any underlying bedrock.

Construction and operational activities could lead to increased sediment loading in surface waters. SCM proposes to mitigate these effects by constructing crossings during periods of low flow and limiting equipment activity to the disturbed footprint. Additionally, during operations, SCM has proposed the use of engineered drainage controls and follow storm water BMPs (described Sections 2.3.7 and 2.3.8) to mitigate impacts to surface waters.

Another potential physical effect, which would be localized near culvert crossings, would be changes to channel hydraulics due to installation of long culverts under the haul road (**Table 2.3-2**). Particularly, straightening naturally sinuous stream channels and the alteration of channel gradients may locally affect stream velocities and channel hydraulics, with resultant alterations in sediment loading from downstream bed and bank scour. SCM notes in their permit materials that the culvert crossings are designed to be hydraulically stable under a wide range of flow conditions and that inlets and outlets will be protected from erosion and scour by use of appropriate armoring. These measures will result in reduced effects to channel hydraulics. However, the extent of the effects on sediment transport and channel stability may be difficult to predict given the intermittent flow regime. More detail on the potential effects to aquatic habitat is provided in Section 3.7. MSUMRA requires that operations be conducted so as to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow or runoff outside the permitted area. Section 82-4-231(10)(k)(ii)(A), MCA (See also **Table 3.3.1**). SCM's permit application includes descriptions of BMPs that would be implemented to minimize sediment transport and inputs to streams.

3.4.3.3 Agency Modified Alternative

The mitigations proposed (**Table 2.4-1)** that would reduce impacts to surface and groundwater resources include:

- Timing construction, reclamation, and disturbance during periods of no or low flow;
- Keeping construction equipment out of saturated or riparian areas;
- Managing the grazing leases to reduce cattle impacts to wetland and riparian areas; and

- Limiting fueling to established stations.

Other proposed changes to the timing of construction and grazing lease management have the potential to reduce erosion and improve surface water quality. The effects of these mitigations are described in greater detail in the Aquatics section (Section 3.7.3.3).

3.5 Vegetation and Wetlands

This section describes the vegetation, climate, and conditions within the AM5 area. The baseline information, coupled with a review of reclamation literature, is used to quantify potential impacts of the alternatives and implications for reclamation plans.

3.5.1 Analysis Methods

The primary source of information and vegetation interpretation for this section was the AM5 application, specifically, AM5 Appendix B (Baseline Vegetation Inventory) and Appendix L2B (Aquatic Resources Inventory). Botanists conducted a baseline vegetation inventory within the area of the proposed disturbance (Scow 2017). In 2014, quantitative sampling was conducted in or near all areas potentially affected by the Proposed Action covering approximately 2,672 acres (4.2 $mi.^2$). In 2015, the study area was expanded to include an additional 2,141 acres (3.3 $mi.^2$). This analysis focuses on the approximately 4,200 acres within the AM5 area, which is fully contained within the larger study area (4,900 acres) described in Scow (2017). The sensitive plant species search as well as a wetland and waterbody inventory was conducted in 2015 (Beaver 2015). The complete report was filed as part of the permit amendment application (Scow 2017). The material presented here summarizes the reports prepared by Scow (2017) and Beaver (2015), and includes qualitative characterization based on a site visit in May 2017. No additional quantitative sampling was conducted.

Vegetation Methods

Field surveys were conducted in June, July, and September 2014 and May 2015 (Scow 2017). Vegetation community type designations were mapped using orthophotos after field reconnaissance. Information on vegetation type and land use (grazing, pasture, and agricultural facilities) was field verified.

Because the survey area was extensive, field survey plots were selected from a 100-foot grid overlaid on the AM5 area using a stratified random procedure. However, to ensure representation of all vegetation types and communities, plot sites were sometimes selected where gridlines intersected drainage bottoms. The intent of the baseline study was to quantitatively characterize vegetation ecology within the permit area and show variability within the availability of sample sites (Scow 2017).

At each sample site vegetation physiognomic types were characterized using canopy cover, shrub density, and tree density as indicators. Physiognomy focuses on the general appearance of an area or overall vegetation community type rather than quantitative species accounting for each grid. Each non-forested plot was also identified as to its occurrence in either a grassland (less than approximately 10 to 15 percent shrub cover) or shrublands stand. The landscape in the AM5 area includes grassland sites that may contain widely scattered shrubs or small clumps of shrubs, as well as dense shrub dominated areas with patchy scattered openings. Therefore, the plot inventory process identifies all of the vegetation within the plot and then characterizes the general community type on a larger scale. As an example, a sample plot may fall in a small opening within a shrub dominated area. Although the sample plot species list may show scant shrub cover, the plot would be mapped as a shrubland mapping unit.

3.5.1.1 Vegetation Classification

Species diversity was evaluated using the average number of vascular plant species per plot. Species nomenclature and functional groups follows Lesica (2012) and, as volumes are published, Flora of North American Editorial Committee (1993+) (Scow 2017). Vegetation classification was based generally on Culwell et al. (1987), the classification of Montana vegetation types developed for the Montana Natural Heritage Program (MNHP). Other regional and local vegetation inventories were also used to assist in the vegetation characterization (Scow 2017). Vegetation community types were defined by, and named for, dominant and co-dominant plant species.

3.5.1.2 Special Status Species and Noxious Weeds

A MNHP database search and a search of the USFWS endangered species website for Big Horn County were conducted (MNHP 2017; USFWS 2017).

Noxious weeds listed by the Montana County Weed Control Act in Big Horn County were qualitatively assessed for distribution and abundance, as well as quantitatively sampled on cover estimation plots (Scow 2017).

3.5.1.3 Ecological Condition and Productivity

Ecological sites were identified and mapped using the baseline soils inventory of the study area, as well as existing NRCS county soil survey information. Ecological condition was then assessed from baseline plant species composition data in addition to site characterization using NRCS (2003 and 2006) guidelines. The similarity index is derived from percent composition of species and cover types using the maximum percent composition values allowed by NRCS technical guides for the relevant ecological sites in the appropriate zone. For the AM5 area, the zone selected was, "Sedimentary Plains East, Northern Rolling High Plains, North Part, 10 to 14- inch precipitation zone (MLRA 58AE)" (NRCS 2003, 2012). Composition values occasionally were adjusted upward for "decreaser" species, those species likely to be reduced by grazing pressure, to better evaluate condition.

Ecological Condition/Similarity Index Class:

Rating	Percent Score
Excellent	76-100
Good	51-75
Fair	26-50
Poor	0-25

Response to grazing and recommended stocking rates (AUM per acre) were determined using NRCS technical guides.

3.5.1.4 Wetland Methods

The wetland and waterbody surveys were conducted in 2014 and 2015 and focused on quantitative sampling of hydrophytic vegetation (plants that thrive in wetter conditions) in addition to a wetland inventory. Wetlands within the AM5 area were identified using the on-site approach described in the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory 1987) as amended by the final Regional Supplement to the Manual: Great Plains Region (Regional Supplement) (USACE 2010). Plots were located within wetlands and uplands to determine the hydrologic, soil, and vegetation indicators necessary to delineate wetland boundaries. Standard data forms (from the Great Plains regional supplement) were completed to assess wetland hydrology, hydric soils and hydrophytic vegetation at potential wetland sites along drainages, floodplains, subirrigated areas, seeps, and springs (Beaver 2015).

Prior to field surveys, additional data were reviewed including the USFWS National Wetland Inventory (NWI), NRCS soils maps for the area, and past monitoring efforts. At each site, hydrology, vegetation, and soil indicators were assessed to determine if wetland characteristics were present. In order to be classified as a wetland, all three indicators must be present. Wetlands develop in the presence of sustained soil saturation during the growing season. Even during drier seasons, evidence of seasonal water presence in the form of sedimentation patterns, drift deposits, and water marks can substantiate hydrology. The seasonal or extended presence of water in the soils leads to physical and chemical changes that can be detected whether the soil is wet or dry such as evidence of oxidative reduction (rusty colors) and gleying (greyish-blue or dark brown coloration). Hydric soils support vegetation adapted to periodic or extended saturation of the root zone which are identified as hydrophytic and listed on the National Wetland Plant List. The major indicator status categories include obligate wetland species (OBL), facultative wetland species (FACW), facultative species (FAC), facultative upland species (FACU) and upland species (UPL), as briefly explained in **Table 3.5-1**.

Table 3.5-1 Major Indicator Status Categories used in the National Wetland Plant List.

Symbol[1]	Indicator Status	Ecological Description	Percent Occurrence in Wetlands
OBL	Obligate	Almost always is a hydrophyte, rarely in uplands	>99
FACW	Facultative Wetland	Usually is a hydrophyte but occasionally found in uplands	67-99
FAC	Facultative	Commonly occurs as either a hydrophyte or nonhydrophyte	34-66
FACU	Facultative Upland	Occasionally is a hydrophyte, but usually occurs in uplands	1-33
UPL	Upland	Rarely is a hydrophyte, almost always in uplands	<1
---	NA	Not present in wetlands. Arid-adapted species	NA

[1] Plus (+) or minus (–) indicators are used to describe species with frequencies that are intermediate between two categories (e.g. FACW+, FAC-).

Typical plot size was a circular 0.01-acre but occasionally varied in order to conform to actual wetland size or shape (Beaver 2015). USACE formulas were used to determine dominant species in each stratum based on visual estimates of percent cover for each species. An area was determined to have hydrophytic vegetation when more than 50 percent of the dominant species from all strata were OBL, FACW, and/or FAC species (the dominance test). In addition to the dominance test, a prevalence index was calculated based on all species present, not just dominant species. In some cases, the prevalence index was used to determine hydrophytic vegetation when the dominance test was not met but when hydric soils and wetland hydrology were present.

Complete methods and analysis information for the wetlands and waterbodies survey is provided in Appendix L2B of the AM5 application (Beaver 2015).

3.5.2 Affected Environment

Vegetation community types were grouped into six primary physiognomic types based on plant structure in relation to topography and land use practices. Physiognomic classification is broader and relies primarily on plant growth form, structure, and cover, rather than species composition. Within a physiognomic type, species composition was used to further sort and describe the communities observed. The six physiognomic types identified in the AM5 area include grassland, tame pasture, shrubland, breaks (shrub dominated and conifer dominated), Pine-Juniper forest and savannah, and drainage bottom (herbaceous, low shrub, and deciduous tree). **Table 3.5-2** presents a summary of vegetation community characteristics described in Scow (2017).

Table 3.5-2. Summary of Vegetation Community Statistics for the AM5 Area as Presented in Scow 2017.

	# Sites	Soil Association[1]	Range Condition (similarity index %)	Productivity (lbs/ac)	Percent Cover: Grasses		Percent Cover: Forbs		Percent Cover: Woody Plants (all perennial)		Shrub density (stems per acre)
					Perennial	Annual	Perennial	Annual	Trees	Shrubs	
Grassland -Native											
Agropyron smithii/ Poa secunda	3	TheSCL/ ThurSCL	33	800	59	43	13	2	0	0	NA
Agropyron smithi/ Stipa viridula	2	TheSCL/ ThurSCL	40	1,000	58	74	5	6	0	0	NA
Stipa comata/ Agropyron smithi	1	ThurSCL	29	475	79	11	6	3	0	2	101
Agropyron spicatum/ Stipa comate	7	TheSCL/ TraSL	69	1,516	56	25	14	3	0	3	578
Agropyron spicatum/ Carex filifolia	4	TheSCL/ MidSL	62	1,240	51	3	25	2	6	10	430
Agropyron spicatum/ Stipa viridula	2	TheSCL/ MidSL	63	1,300	59	24	9	8	0	3	253
Grassland -Tame Pasture											
Hay cropland	10	ThuSCL	0		69	<1	69	3	0	0	NA
Grazed/ Go-back Pasture	26	McRSL/ ThuSCL/ RenCL	13		77	5	12	11	0	3	910
Prairie Dog Influenced Pasture	3	TheSCL	9		9	<1	18	57	0	0	NA
Shrub-Dominated (Artemisia tridentata/ Agropyron cristatum	7	TheSCL/ RenCL	27	530	64	6	7	9	0	30	3,469
Shrubland											
Artemisia tridentata (5 communities)	112	All types	41-62	940-1,345	46-67	7-33	9-16	4-8	0	20-39	2,884-3,845
Artemisia cana	5	ThuSCL/ MidSL	47	865	72	51	13	26	0	28	2,388
Rhus aromatica	2	MidSL	67	935	55	19	11	4	0	35	3,390
Breaks Complex											
Shrub dominated breaks (3 communities)	31	MidSL	62-73	633-943	19-34	2-4	10-12	2-4	0-6	14-24	2,378-5,464
Conifer-dominated	15	MidSL	48	840	17	2	12	2	37	5	1,160
Pine-Juniper/Savannah											
Pine-Juniper/Grass	38	MidSL	27-50	411-950	3-44	1-2	6-26	2-22	48-87	<1-8	304-2,732
Pine-Juniper/Shrub	4	MidSL	39	553	45	10	30	8	44	17	3,820

Table 3.5-2. Summary of Vegetation Community Statistics for the AM5 Area as Presented in Scow 2017.

	# Sites	Soil Association[1]	Range Condition (similarity index %)	Productivity (lbs/ac)	Percent Cover: Grasses		Percent Cover: Forbs		Percent Cover: Woody Plants (all perennial)		Shrub density (stems per acre)
					Perennial	Annual	Perennial	Annual	Trees	Shrubs	
Drainage Bottoms											
Hydrophytic herbaceous	20	Kor/Loh	29	3,344-4,900	96	3	<1-32	<1-18	0	<1-2	0-270
Mesophytic shrub	8	MidSL/ Loh/ TheSCL	40	1,712-2,100	66	20	27	9	<1	58	16,222-82,057
Mesophytic deciduous tree	20	Kor	7-14	1,240	32-90	0-3	7-32	20-66	86-99	0-15	0-4,486

1 Soil Association codes:

Soil Name	Symbol		Soil Name	Symbol
Korchea	Kor		Renohill clay loam	RenCL
Lohmiller	Loh		Thedalund silty clay loam	TheSCL
McRae silt loam	McRSL		Thurlow silty clay loam	ThuSCL
Midway shallow loam	MidSL		Travesilla shallow loam	TraSL

3.5.2.1 Grasslands

Upland herbaceous communities or grasslands were classified as native or tame pasture based on species composition and evidence of past or current land management. Tame pasture makes up approximately 17 percent of the permit area (733 acres). Native grassland covers approximately 6 percent of the permit area (263 acres).

Native Grassland

The three grassland series were dominated by Western wheatgrass (*Agropyron smithii*) (two community types), needle-and-thread (*Stipa comate)* (one community) and bluebunch wheatgrass (*Agropyron spicatum)* (three communities). Grasslands in the AM5 permit area are in low to good condition. Grassland range condition collectively average 56 percent (low-good condition), and range from 39 percent to 66 percent. Grassland productivity collectively averaged 1,210 pounds per acre.

Tame Pasture

Four types of tame pasture were present in the permit area, including hay cropland, grazed or go-back pastureland, prairie dog-influenced pastureland, and a shrub-dominated community type containing big sagebrush (*Artemisia tridentata*) and crested wheatgrass (*Agropyron cristatum*). Range condition cannot technically be calculated for tame pasture, as any land tilled and seeded for tame pasture cropland is not considered to represent an ecological site due to soil disturbance and potential seeding of non-native species. Similarly, productivity on tame pasture is based on a compilation of long-term annual production data from NRCS and is presented as representative values. The hay cropland type can be expected to produce, on average, 3 to 6 irrigated tons per acre and 0.6 to 1.8 non-irrigated tons per acre depending on the soil. Local ranchers provided data that suggested that typical non-irrigated hay yields in the permit area are about 0.7 to 1.25 tons per acre. Typical irrigated hay yields for the Youngs Creek floodplain in the permit area are 1.9 tons per acre (Scow 2017).

3.5.2.2 Shrubland

There were seven shrubland communities in three series identified during the 2014 inventory. Two series were dominated by silver sagebrush (*Artemisia cana*) and skunkbush sumac (*Rhus aromatica*), and the third series was dominated by big sagebrush. The big sagebrush series is the most abundant vegetation series, occurring on all topographical positions in the AM5 area except major drainage floodplains terraces where tame pasture, riparian, or wetland types predominate. Shrubland community types in the AM5 area comprised 2,042 acres or 47 percent of the total permit area acreage (Scow 2017).

Although upland shrubland communities are similar compositionally to their grassland counterparts, particularly in the understory, the shrub community averaged substantially higher cover and shrub density (Scow 2017). Many of the upland drainage bottoms were classified and described within the shrubland rather than the drainage bottom physiognomic type because of similarities in community composition to other upland shrub community types. In other words, these drainage areas were dominated by sage brush and other more typically arid adapted plants rather than mesic (moist area) plants.

Using NRCS guidelines, shrublands in the AM5 area are in low to good condition, with a similarity index ranging from 52 to 65 percent (**Table 3.5-2**). Shrubland productivity was approximately 4 percent higher than that for native grassland productivity at 1,255 pounds per acre, and ranged from 900 to 1,565 pounds per acre.

3.5.2.3 Breaks Complex

Breaks complex or badlands vegetation types, normally occur on broken, moderately steep to very steep, occasionally gentle slopes on shallow, skeletal soils frequently associated with rock outcroppings. Vegetation cover in breaks areas is generally sparse and can be dominated by grasses, shrubs, or conifer species. The variable vegetation found in these areas is a result of microsite conditions due to the highly dissected topography. In the AM5 area, it is convenient to group breaks community types into two physiognomic subtypes dominated by shrub or coniferous tree species. Scow (2017) described three shrub-dominated breaks types and one conifer-dominated break type. These four breaks complex communities comprised 589 acres or 14 percent of the total permit area acreage. Within the breaks complex, shrub-dominated breaks covered 69 percent, and the conifer-dominated breaks covered 31 percent.

Using NRCS guidelines, the breaks complex in the AM5 permit area is in high-fair to mid-good condition. Productivity in the shrub breaks complex ranged from 635 to 1,175 pounds per acre. The conifer-dominated breaks averaged 840 pounds per acre productivity.

3.5.2.4 Ponderosa Pine-Juniper Forest and Savannah

There were four Pine-Juniper communities identified during the baseline inventory. Three communities were distinguished for their grass understory and one was characterized by the shrub understory. Forest and savannah community types were sampled on a variety of soils, topographical positions, and aspects. Pine-Juniper/grass communities were normally associated with middle to high topographical positions and moderately steep to steep slope gradients or cool, northwesterly general easterly exposures (Scow 2017). The Pine-Juniper/shrub communities were associated with drainage bottoms or banks and low slope positions in variable steepness and exposure. The four ponderosa pine forest and savanna communities collectively averaged 51 percent condition (low-good), varying from 32 to 58 percent. Productivity of the four ponderosa pine forest and savanna communities collectively averaged 885 pounds per acre.

3.5.2.5 Drainage Bottoms

Drainage bottom vegetation types collectively made up about 589 acres or 14 percent of the AM5 area (**Table 3.5-3**). These communities are limited to the drainage bottoms and adjacent toe slopes, swales, and coulee banks, sites which receive supplemental water from snow catchment, shallow groundwater, or seepage. These areas create linear oases in the otherwise arid landscape. Using NRCS guidelines, drainage bottom communities of the AM5 area are in poor to mid-fair condition. However, these plant communities tended to be much more densely vegetated with percent cover approaching 100 percent at many sites (Scow 2017).

Drainage bottoms and riparian areas tend to be more diverse and more productive than the arid lands around them. The greater water availability supports denser vegetation, and therefore intermittent and perennial waterways provide greater cover and better forage for migrating wildlife, particularly during the dry season.

Drainage bottom types were generally lower condition than most other physiognomic types, as cattle, similar to wildlife, are attracted to these areas and grazing and trampling tend to decrease vegetation composition and reduce overall structure. The similarity index for herbaceous bottom types averaged 31 percent (low-fair) condition, ranging from 17 to 38 percent. The mesophytic shrub bottom was in fair condition (40 percent) and the deciduous tree bottom was in poor condition (14 percent). Despite generally being in poorer condition than most of the other types, drainage bottoms averaged highest productivity per unit area, as is typical for riparian and wetland areas in an arid landscape. Herbaceous bottom types averaged 3,340 pounds per acre, and mesophytic shrub bottom productivity averaged 1,710 pounds per acre. Deciduous tree bottom was lowest of all drainage bottom types and averaged 1,240 pounds per acre.

3.5.2.6 Weeds and Invasive Plants

Noxious Weeds

Four state-listed weed species, all Priority 2B, were encountered on the AM5 area during the 2014 baseline inventory. Priority 2B noxious weeds are weeds that are abundant in Montana and widespread in many counties. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses. Management criteria requires containment and suppression where 2B species are abundant and widespread, and eradication or containment, prevention, and education where less abundant. Management would be prioritized by the local weed district. Noxious weed species recorded in the permit area were Canada thistle (*Cirsium arvense*), field bindweed (*Convolvuvlus arvensis*), Dalmatian toadflax (*Linaria dalmatica*), and common hound's-tongue (*Cynoglossum officinale*). Canada thistle was restricted to wetter sites associated with drainage bottom communities. Hound's-tongue was associated with less saturated drainage bottom communities. Field bindweed was most common in hay cropland and pastureland, particularly prairie dog towns, but was also found in mesophytic herbaceous drainage bottom communities (Scow 2017).

Cheatgrass

Although not considered a noxious weed, cheatgrass (*Bromus tectorum*), is a regulated plant in Montana. The presence and dominance of cheatgrass affects many aspects of community structure, process, and function including diversity of plant and animal species, disturbance regimes, succession to other undesirable nonnative plants, nutrient cycling, and soil attributes. These changes may require substantial human intervention to convert to more desirable ecosystems (Zouhar 2003). Cheatgrass can completely replace native vegetation creating monoculture areas and changing fire regimes (Zouhar 2003). Cheatgrass was one of the more common species recorded in the 2014 baseline survey, particularly in the native grassland physiognomic types, often occupying 30 to 68 percent of the vegetation cover observed (Scow 2017). It is interesting to note that cheatgrass was not recorded or recorded at very low levels (less than 2 percent) in many of the tame pasture sites.

Like many invasive species, cheatgrass is an opportunistic plant and can grow on all exposures and all types of topography. Cheatgrass thrives in years with good rainfall, but can also survive periodic drought. Cheatgrass tends to grow in very dense populations and is highly flammable once dry (Zouhar 2003). The presence of cheatgrass can intensify wildfires that can permanently damage native plant communities resulting in greater erosion potential. Soil water depletion is one of the principal mechanisms that allows cheatgrass to successfully compete with perennial grasses and may negatively impact root growth of native species, especially during the establishment of perennial grass seedlings. Cheatgrass has been shown to deplete soil moisture and reduce growth of natives found in the AM5 area including Idaho fescue, bluebunch wheatgrass, green rabbitbrush, and needle-and-thread grass. It has also been observed to impede the establishment of native seedlings such as big sagebrush, green rabbitbrush, and antelope bitterbrush; species that are focal for reclamation of big sagebrush communities.

Although it does provide good forage when green, its green stage is fleeting and thus is less dependable for grazing livestock or wildlife (Zouhar 2003). In addition, when dry, the sharp seeds can damage cattle mouths and eyes (Zouhar 2003).

3.5.2.7 Wetlands

The majority of wetland acreage in the AM5 area occurs on portions of the broad Youngs Creek floodplain. Approximately 58 of the 69 acres (84 percent) of wetlands delineated in the AM5 area were located along Youngs Creek (Beaver 2015). Wetlands along Little Youngs Creek and Squirrel Creek are mostly associated with discontinuous, narrow streamside fringes (Beaver 2015). Such sites are generally missed by the stratified random procedure used to select vegetation sample sites, whereas these sites were specifically targeted for identification and delineation during the baseline wetland inventory. Flowing surface water was recorded in Little Youngs Creek, Youngs Creek, and Squirrel Creek during the 2014 and 2015 surveys (Beaver 2015). Dry Creek was dry as were all tributary drainages to all of these streams during the 2014 and 2015 surveys. Standing surface water was noted at some wetlands within the AM5 area, although in very limited quantities at many sites. Many wetlands also contained saturated soil or a high water table within the survey soil pit. In some areas, particularly within the wetlands that surrounded Youngs Creek, intermixing between water that originated within the stream (either surface or subsurface) and groundwater discharge appeared to occur (Beaver 2015).

Hydric Soils

Hydric soils were found within the subirrigated zone around Squirrel Creek, Little Youngs Creek, and Youngs Creek. In most of these locations the soils were finely textured clays and clay-loams. No organic soils (e.g., histosols or histic epipedons) were observed.

Wetlands occurred primarily within the Korchea and Frazer soils type, although upland plots were also within this soil type as it covers the majority of the ancient floodplains of Squirrel Creek, Little Youngs Creek, and Youngs Creek and is primarily non-hydric (Beaver 2015).

Hydrophytic Vegetation

Hydrophytic vegetation within the AM5 area was dominated by herbaceous wetlands (Palustrine Emergent or PEM) with a few areas of shrub wetlands (Palustrine Scrub-Shrub or PSS) and a few forested wetlands (Palustrine Forested or PFO). **Table 3.5-3** lists the acreage of each wetland type according to its Cowardin (1979) classification as well as the percentage of each type within the AM5 area. Herbaceous (PEM) wetlands within the AM5 area were the most common type of wetland, making up 90 percent of all wetland acres surveyed (Beaver 2015). PEM wetlands covered approximately 62.5 acres. **Table 3.5-4** lists the dominant hydrophytic species observed. Sedges, rushes, and prairie cordgrass were more prevalent within the wetland interiors while redtop, Kentucky bluegrass, and smooth brome were more prevalent near the transition between wetlands and mesic meadows or upland sites.

Table 3.5-3. Wetland Acreage and Percent by Cowardin Type as Delineated in the AM5 Area.		
Cowardin Type	**Acres**	**Percent of Total Wetlands Delineated**
Palustrine Emergent (herbaceous wetland)	62.5	90
Palustrine Unconsolidated Bottom (excavated or impounded pond)	3.1	4.5
Palustrine Forested (plains cottonwood or peachleaf willow dominated)	2.7	3.9
Palustrine Scrub-Shrub (sandbar willow dominated)	1.1	1.5
Total	69.4	99.9

Source: Beaver 2015

Table 3.5-4. Dominant Hydrophytic Species Observed in Wetlands within the AM5 Area.	
Common Name	**Latin Name**
Herbaceous (PEM)	
Nebraska sedge	*Carex nebrascensis*
Sawbeak sedge	*Carex stipata*
wooly sedge	*Carex pellita*
clustered field-sedge	*Carex praegracillus*
Baltic rush	*Juncus balticus*
Prairie cordgrass	*Spartina pectinata*
Redtop	*Agrostis stolonifera*
Foxtail barley	*Hordeum jubatum*
Kentucky bluegrass	*Poa pratensis*
Smooth brome	*Bromus inermus*
Forested (PFO)	
Peachleaf willow	*Salix amygdaloides*
Plains cottonwood	*Populus deltoides*
Scrub-shrub (PSS)	
sandbar willow	*Salix exigua*
Bebb's willow	*Salix bebbiana*

Source: Beaver 2015

Three forested (PFO) wetlands dominated by either peachleaf willow or plains cottonwood were recorded in the AM5 area. Two small wetlands dominated by peachleaf willow were mapped in the Little Youngs Creek watershed near the western boundary of the AM5 area and were associated with both subsurface water as well as the upstream influence of a small impoundment. A relatively large (2.5 acre) wetland dominated by plains cottonwood was mapped near Youngs Creek in the approximate center of the AM5 area. This wetland appeared to have been created by water impounded behind a constructed dike and may have been a pond historically but is now dominated by mature plains cottonwood trees. PFO wetlands were 3.9 percent of all wetland acres surveyed (Beaver 2015). PFO wetlands covered approximately 2.7 acres.

Scrub-shrub (PSS) wetlands were relatively uncommon within the AM5 area and accounted for little acreage (total of 1.1 acre) and only 1.5 percent of the acres surveyed (Beaver 2015). Scrub-shrub wetlands were dominated primarily by sandbar willow intermixed with other willows such as Bebb's willow.

Four ponds constructed in uplands were recorded. All of these ponds lacked hydrophytic vegetation except pond Y-P-3 which contained water ladysthumb (*Polygonum amphibium*) but lacked hydric soils (Beaver 2015).

Three ponds (L-P-1, L-P-2, and Y-P-2) occurred in areas that may have contained wetlands or waterbodies prior to construction (Beaver 2015). These ponds occurred behind constructed impoundments, contained areas with open water and an unconsolidated bottom (i.e., mud), and were surrounded by hydrophytic vegetation. The ponds made up 4.5 percent of the wetlands delineated and covered approximately 3.1 acres (Beaver 2015).

3.5.3 Environmental Consequences

MSUMRA includes requirements specific to establishment of diverse, productive vegetative communities similar to those present before disturbance (82-4-233, MCA; ARM 17.24.301(47)). The specific vegetation reclamation actions for the AM5 area are included in the permit amendment application and focus on establishing wildlife habitat and providing quality forage habitat for cattle (grazing) and wildlife to re-establish premine land uses. All aspects required under MSUMRA would occur under either action alternative. DEQ completed an Alluvial Valley Floor Determination and it is located in **Appendix C.**

3.5.3.1 No Action Alternative

Under the No Action Alternative, the transportation corridor would not be constructed. Therefore, no disturbance related to the project in the AM5 area would occur. Current sources of disturbance to vegetation, wetlands, and riparian areas would be expected to continue, such as those associated with cattle grazing. Although there would be no new disturbance or increase in truck traffic, the potential for noxious weed spread from incidental traffic on existing ranch roads would continue as well. However, current weed control has been effective at containing weeds and responding to or preventing new areas from becoming established. The Thunder Basin CI/CP includes 800 acres of conifer reduction and revegetation with shrubland and native grass species. This action would occur independent of the AM5 haul road.

3.5.3.2 Proposed Action Alternative

Primary impacts to vegetation would stem from surface disturbance during construction of the haul road. Impacts would include removal of established perennial vegetation communities such as sagebrush and juniper stands as well as native grassland communities. Vegetation would be removed and exposed surface soils would be subject to greater erosion from precipitation and wind. Some areas would be disturbed during construction, but reclaimed and revegetated once the roadway was established such as the berm sides and staging areas. MSUMRA requires that seed mixes and BMPs for revegetation be approved and monitored for success. No vegetative communities would be disproportionally affected by the Proposed Action in terms of their relative abundance, but shrublands, riparian, and wetland areas, and noxious weeds would be the focus of the potential adverse impacts (**Figure 3.5-1**).

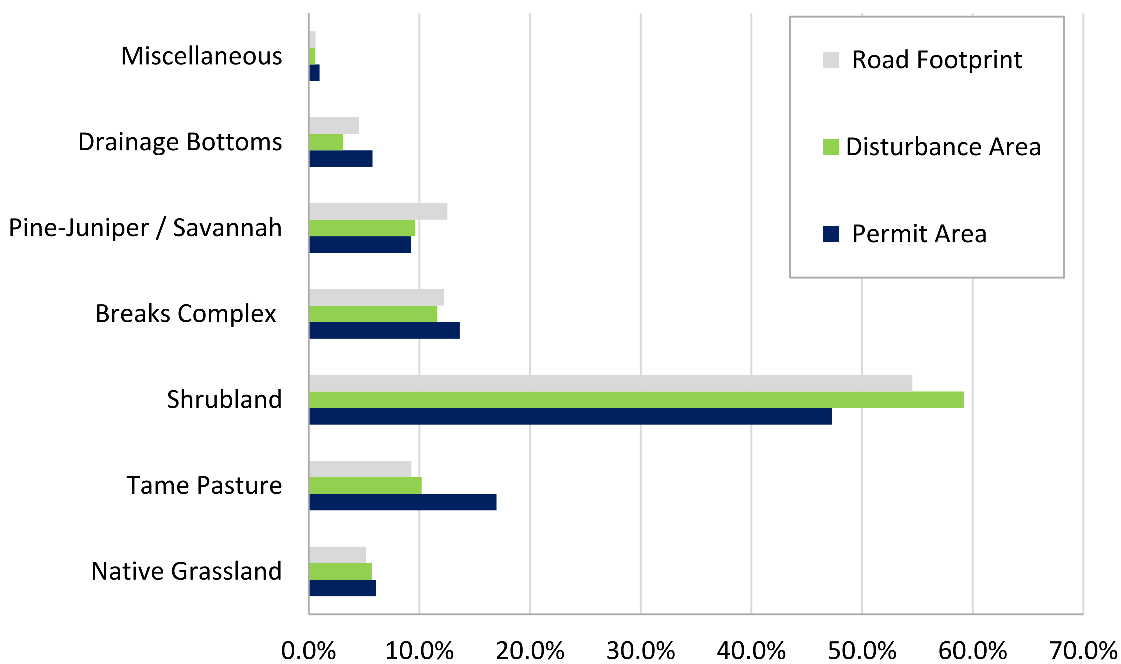

Figure 3.5-1. Relative abundance of vegetation community types as identified in Scow (2017) within the AM5 permit area, the disturbance area, and the road footprint.

Shrublands

Shrublands are the most common vegetation community across the AM5 area, are part of the areas designated as greater sage-grouse core habitat, and make up the largest component (59 percent) of the area to be disturbed covering 568 of the total 960 acres in the disturbance area. The dominant species in the AM5 shrublands community is big sagebrush (**Table 3.5-5**). Shrublands cover approximately 165 of the 303 acres that would become the roadway footprint. These 165 acres would be lost for the duration of the project. In addition, the roadway would break up currently contiguous areas of shrubland which may fragment and thereby reduce those areas' utility as wildlife habitat. Shrub-dominated breaks complexes make up the next largest component (12 percent) of the roadway footprint at 37 acres. Big sagebrush is also the dominant species in this breaks complex, but because of their steep topography, breaks complexes are often used by wildlife for cover. Sagebrush reclamation is an active field of research and methods for increasing regeneration success while reducing costs are emerging (Kleinman and Richmond 2000, Schuman and Richmond 2000).

The additional 400 acres of shrubland that would be disturbed during construction, but reclaimed prior to operation, also represent a large loss of perennial, higher value wildlife habitat. If the shrublands are cleared during construction, it is possible that they would be functionally recovered before the end of the project's proposed 15–18 year duration. SCM has demonstrated Phase III bond release for wildlife habitat, including areas with shrub densities of over 26,000 shrubs per acre, in as few as 11 years. Phase III bond release is DEQ's measure of successful revegetation establishment. However, even a 10 year recovery period would mean that the primary impact of shrub removal may lead to more extensive secondary (long-term) impacts in this vegetative community than in other faster regenerating communities such as grasslands (See Section 4.4.4).

Table 3.5-5. Summary of Acreage and Percent Cover for Vegetation Community Types within the AM5 Area, the Disturbed Area, and the Roadway Footprint							
Code from Plate B4-1	**Vegetation Community Type**	**Acres in Permit Area**	**Percent Cover in Permit Area**	**Acres in Disturbance Area**	**Percent Cover in Disturbance Area**	**Acres in Road Footprint**	**Percent Cover in Road Footprint**
	Native Grassland[1]	**263.59**	**6.1%**	**54.62**	**5.7%**	**15.65**	**5.2%**
11	Agropyron smithii/ Poa secunda						
11	Agropyron smithii/ Stipa viridula						
11	Stipa comata/ Agropyron smithii						
11	Agropyron spicatum/ Stipa comate						
11	Agropyron spicatum/ Carex filifolia						
11	Agropyron spicatum/ Stipa viridula						
	Tame Pasture	**732.7**	**17%**	**97.97**	**10.2%**	**31.52**	**9%**
21	Hay cropland	115.24	2.7%	12.97	0.3%	3.37	1.1%
22	Grazed/ Go-back Pasture	333.1	7.7%	34.60	0.8%	14.67	4.8%
23	Prairie Dog Influenced Pasture	134.65	3.1%	4.78	0.1%	2.5	0.8%
24	Shrub-Dominated (Artemisia tridentata/ Agropyron cristatum	149.71	3.5%	45.61	1.1%	10.98	3.6%
	Shrubland	**2,042.25**	**47%**	**568.16**	**59.2%**	**165.42**	**55%**
32	Artemisia tridentata (5 communities)	2,023.26	46.8%	560.38	13.0%	163.23	53.8%
31	Artemisia cana	18.99	0.4%	7.78	0.2%	2.19	0.7%

Table 3.5-5. Summary of Acreage and Percent Cover for Vegetation Community Types within the AM5 Area, the Disturbed Area, and the Roadway Footprint							
Code from Plate B4-1	**Vegetation Community Type**	**Acres in Permit Area**	**Percent Cover in Permit Area**	**Acres in Disturbance Area**	**Percent Cover in Disturbance Area**	**Acres in Road Footprint**	**Percent Cover in Road Footprint**
31	Rhus aromatica						
	Breaks Complex	**589.25**	**14%**	**111.53**	**11.6%**	**37.14**	**12%**
41 or 42	Shrub dominated breaks (3 communities)	399.46	9.2%	77.39	1.8%	26.97	8.9%
43	Conifer-dominated	189.79	4.4%	34.14	0.8%	10.17	3.4%
	Pine-Juniper / Savannah	**399.04**	**9%**	**92.4**	**9.6%**	**38**	**13%**
51	Pine-Juniper/Grass	386.95	9.0%	89.05	2.1%	36.7	12.1%
52	Pine-Juniper/Shrub	12.09	0.3%	3.35	0.1%	1.3	0.4%
	Drainage Bottoms	**249.31**	**6%**	**29.8**	**3.1%**	**13.71**	**5%**
61	Hydrophytic herbaceous	134.19	3.1%	14.99	0.3%	9.14	3.0%
71	Mesophytic shrub	26.38	0.6%	3.84	0.1%	0.5	0.2%
81	Mesophytic deciduous tree	88.74	2.1%	10.97	0.3%	4.07	1.3%
	Miscellaneous	**42.55**	**1.0%**	**5.57**	**0.6%**	**1.86**	**0.6%**
91	Buildings/ corrals	2.02	0.0%	0	0.0%	0	0.0%
92	Roads	24.12	0.6%	4.75	0.1%	1.59	0.5%
93	Other Disturbance	6.65	0.2%	0.43	0.0%	0.05	0.0%
94	Reclamation	3.66	0.1%	0	0.0%	0	0.0%

Table 3.5-5. Summary of Acreage and Percent Cover for Vegetation Community Types within the AM5 Area, the Disturbed Area, and the Roadway Footprint

Code from Plate B4-1	Vegetation Community Type	Acres in Permit Area	Percent Cover in Permit Area	Acres in Disturbance Area	Percent Cover in Disturbance Area	Acres in Road Footprint	Percent Cover in Road Footprint
95	Ponds	6.1	0.1%	0.39	0.0%	0.22	0.1%
	Total Acres[2]	4,318.69	100%	960.0	100%	303.3	99.9%

Source: Scow 2017

1 Sub-types within the Native Grassland community type were lumped as one code on the vegetation mapping.

2 Total acreage in the permit and disturbance areas is slightly less (<1 percent difference) than reported in the AM5 application due to rounding and polygon overlap.

Riparian and Wetland Areas

The large berms and fill areas in the drainage bottoms would constitute the greatest disturbances to vegetation because these areas would require a much wider footprint and a consequently larger change to the existing vegetative cover. The USACE has estimated that 5.3 acres of wetlands concentrated near Youngs Creek and a total of 4,203 linear feet of stream channel along Dry, Squirrel, Youngs and Little Youngs Creeks would be impacted (USACE 2017). The placement of 60 to 90 vertical feet of fill in some areas would alter the topography, potentially compact the shallow surface soil, and could reduce biological activity in the surface soils buried by the fill. Geotextile fabric is proposed to lessen some of the compaction in the more vulnerable wetland areas. However, the culverts would reduce groundwater infiltration in the wetland areas and could change the overall soil structure over the proposed 15-18 year project duration.

Topsoil would be stockpiled and stabilized during land clearing activities. These topsoils would be replaced as part of reclamation activities. Some of the shrub community types would take longer to become re-established during reclamation than grassland communities.

Noxious Weeds

Opportunistic and noxious weeds would have a greater chance of becoming established and spreading just after soil disturbance and during operation along the edges of the roadway. The berm sides and other revegetated areas will require aggressive, consistent weed control in line with SCM's established weed control plan on file with Big Horn County. Most of the vehicles used on the roadway would be dedicated to the SCM and YCM sites, so the potential for introducing weed seeds from outside of the mine would be lessened. However, trucks and other vehicles that do leave the AM5 permit area could pick up weed seeds and bring them to the mine haul road. The use of herbicides to control weeds may kill some native vegetation and could contribute to grass fires due to the presence of dead or dying vegetation, though SCM is typically spot spraying so these disturbance areas would be minimal.

MSUMRA includes requirements specific to establishment of diverse, productive vegetative communities similar to those present before disturbance (82-4-233, MCA; ARM 17.24.301(47)). The specific reclamation actions for the AM5 area are included in the permit amendment application and focus on establishing wildlife habitat and providing quality forage habitat for cattle (grazing) and wildlife to re-establish premine land uses.

3.5.3.3 Agency Modified Alternative

The AMA would not change the total acres of surface disturbance, nor would it change the distribution or type of areas disturbed during construction or operation. The AMA includes mitigations to alter grazing practices to support cheatgrass control and to rotate cattle across the grazing areas. These mitigations would reduce the impacts outside of the disturbance area and may help to conserve native seed sources and vegetation diversity. Replanting sagebrush in areas that may have been colonized by conifers and decommissioning and reclaiming abandoned roads would increase the overall occurrence of big sagebrush communities and improve habitat conditions for sagebrush dependent wildlife. The acreage targets for these mitigations have not been identified; therefore, quantitative analysis of these mitigations is not possible at this time.

There are no other mitigations specifically targeting vegetation resources, but some of the mitigations that would reduce impacts to the soils and hydrology near riparian and wetland areas would support revegetation and reclamation efforts. All other aspects of the Proposed Action would persist including the potential impacts to shrublands, riparian, and wetland areas, and noxious weeds.

3.6 Wildlife

This section describes applicable wildlife regulations, the affected environment, and the evaluation of potential impacts on wildlife within the wildlife study area. The wildlife study area includes the AM5 permit area and a buffer area of up to two miles on either side of the permit area (**Figure 3.6-1**). The regulatory framework protecting wildlife resources in Montana includes both state and federal laws and is described below.

3.6.1 Federal Regulations

3.6.1.1 Endangered Species Act (ESA)

The ESA directs the USFWS to identify and protect endangered and threatened species and their critical habitat, and to provide a means to conserve their ecosystems. Among its other provisions, the ESA requires the USFWS to assess civil and criminal penalties for violations of the Act or its regulations. Section 9 of the ESA prohibits take of federally listed species. Take is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct” 16 U.S.C. 1532. The term “harm” includes significant habitat alteration which kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering, 50 CFR 17.3.

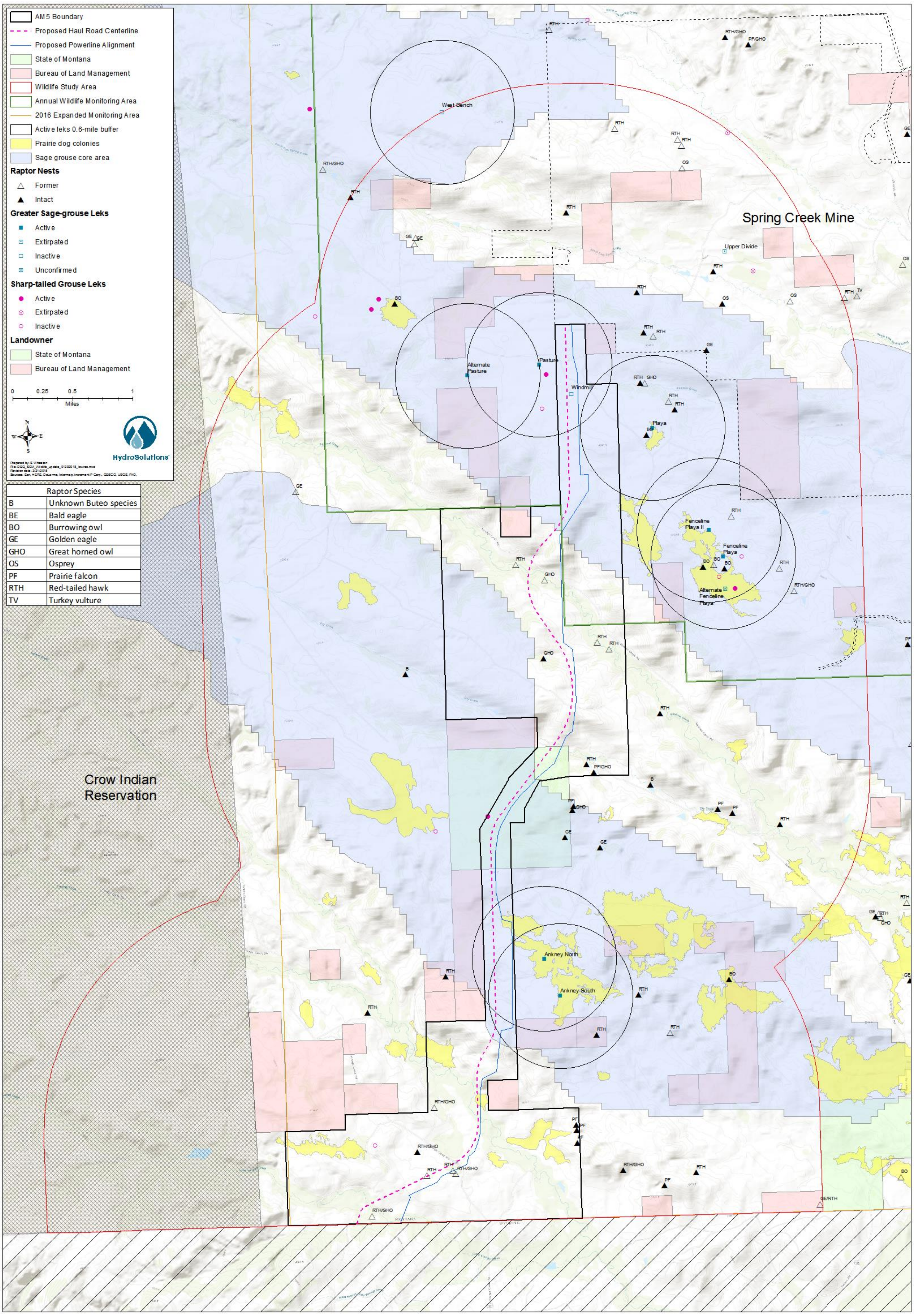

Figure 3.6-1. The SCM Annual Wildlife Monitoring Area.

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3.6.1.2 Migratory Bird Treaty Act (MBTA)

The MBTA is the cornerstone of migratory bird conservation and protection in the United States. The statute's language is resulting in a "taking" or possession (permanent or temporary) of a protected species, in the absence of a USFWS permit or regulatory authorization, are a violation. The MBTA states, "Unless and except as permitted by regulations … it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird …" 16 U.S.C. 703. The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" 50 CFR 10.12. The USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines.

3.6.1.3 Bald and Golden Eagle Protection Act (BGEPA)

Under authority of the Eagle Act, 16 U.S.C. 668–668d, bald eagles and golden eagles are afforded additional legal protection. The BGEPA prohibits the take, sale, purchase, barter, offer of sale, purchase, or barter, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof, 16 U.S.C. 668. The BGEPA also defines take to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb," 16 U.S.C. 668c, and includes criminal and civil penalties for violating the statute. See 16 U.S.C. 668. The term "disturb" is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury to an eagle, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior, 50 CFR 22.3.

3.6.2 State Regulations

The requirements of the Montana Strip and Underground Mine Reclamation Act (MSUMRA; 82-4-201 et. seq., MCA) as they apply to wildlife are summarized in Table 3.6-1. MSUMRA requires operators to "minimize disturbances and adverse impacts" of mining on fish, wildlife, and related environmental values "to the extent possible, and using the best technology currently available" and to "achieve the enhancement of those resources when practicable." Section 82-4-231(10) (j), MCA. Montana Fish, Wildlife and Parks (MFWP) sets the state policies for the protection and management of the state's wildlife (game and non-game, 87-1-301, MCA). MFWP and the Montana Natural Heritage Program (MNHP), identify species of concern based on their vulnerability to extinction in Montana (see also Section 3.6.2.1).

The State of Montana has issued three Executive Orders specific to greater sage-grouse management; including EO 10-2014, EO 12-2015, and EO 21-2015. EO 12-2015 amended EO-2014 and provides for implementation of the Montana Sage Grouse Conservation Strategy, generally construed in a manner that is consistent with the provisions of Senate Bill 261, passed during the 2015 Montana Legislative Session. EO 21-2015 directs all Montana state agencies to comply with EO 12-2015.

Table 3.6-1 Applicable Rules and Regulations for Wildlife

Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 17.24 Subchapter	**Summary of Requirement**
3	Contains requirements of the surface mine permit application which includes gathering wildlife baseline information including: a list of all fish and wildlife species; population density estimates of each species insofar as practicable; a description of season or seasons of use and habitat use by each species along with a description of habitats of unusually high value; a wildlife habitat map for the entire wildlife survey area; coverage of the proposed permit area plus an area around it (ARM17.24.304); requirements for the fish and wildlife plan (ARM17.24.312); and, requirements of the reclamation plan (ARM17.24.313).
6	Requires that support facilities be designed, constructed or reconstructed, maintained, and used in a manner which prevents, to the extent possible using the best technology currently available, damage to fish, wildlife, and related environmental values (ARM17.24.609).
7	Contains requirements to conduct wildlife monitoring (ARM17.24.723); protect fish, wildlife, and related environmental values including compliance with federal laws (ESA, BGEPA); ensure the design and construction of electric powerlines and other transmission facilities are adequate to minimize collisions and electrocutions of raptors, waterfowl, and other wildlife species (all powerlines must be constructed in accordance with *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* [Avian Power Line Interaction Committee 1996]; locate and operate haul and access roads to avoid or minimize impacts to important fish and wildlife species or other species protected by state or federal law; design and construct fences and other potential structures to permit passage of wildlife; and other protective measures (ARM17.24.751).

Table 3.6-1 Applicable Rules and Regulations for Wildlife	
Applicable Rules and Regulations under the Montana Strip and Underground Mine Reclamation Act	
82-4-2,MCA Subpart	**Summary of Requirement**
231	Requires submission of a reclamation plan which, to the extent possible using the best technology currently available, minimizes disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values and achieves enhancement of those resources when practicable.
233	Requires that the planting of vegetation following the grading of a disturbed area be compatible with the plant and animal species of the area; and that fish and wildlife habitat must be planted to achieve appropriate stocking rates.
235	Determination of successful revegetation for final bond release - for areas reclaimed for use as fish and wildlife habitat, success of revegetation must be determined on the basis of approved characteristics required to achieve the postmining land use.

3.6.3 Analysis Methods

The affected environment for wildlife is described primarily using the following sources:

- SCM Application for AM5; including:
  Fish and Wildlife Plan (17.24.312),
  Reclamation Plan (17.24.313),
  Monitoring (17.24.723),
  Protection and Enhancement of Fish, Wildlife, and Related Environmental Values (17.24.751)

- Spring Creek Mine 2014 Wildlife Monitoring Report (Thunderbird Wildlife Consultants [TWC] 2015)
- Spring Creek Mine 2015 Wildlife Monitoring Report (TWC 2016)
- Spring Creek Mine 2016 Wildlife Monitoring Report (Great Plains Wildlife Consulting, Inc.- GPWC 2017)
- Spring Creek Coal, LLC *DNRC Dry Creek Commercial Lease Proposal Environmental and Supporting Data.*
- Certificate of Inclusion and Participation Arrowhead I LLC Conservation Measures for the Thunder Basin Grasslands Prairie Ecosystem Association Conservation Strategy (2017)
- Management Plan and Conservation Strategies for Sage Grouse in Montana – Final (MFWP 2005)

- MFWP Sage Grouse Lek database (MFWP 2017)

In addition, a data query of the MNHP database for the area within the boundaries of the Wildlife Study Area and a search of the USFWS endangered species website for Big Horn County were conducted (MNHP 2017; USFWS 2017).

3.6.4 Affected Environment

The most common vegetation community in the AM5 area is shrubland (primarily big sagebrush, occupying 47 percent of the AM5 area), followed, in order of abundance, by cropland and pasture, breaks complex (shrub dominated—mostly big sagebrush and conifer dominated [Rocky Mountain juniper and ponderosa pine]), ponderosa pine-juniper forest and savannah, grassland (wheatgrass and needle-and–thread), and riparian and wetland drainage bottom (Scow 2017). Sandstone outcrops and clay cliff faces are scattered throughout the AM5 area. The three primary drainages bisecting the area, Squirrel Creek, Youngs Creek, and Little Youngs Creek; all have well developed riparian corridors. The Dry Creek drainage is ephemeral. The vegetation communities are described in more detail in Section 3.5, Vegetation and Wetlands, and the aquatic environment is described in Section 3.7, Aquatics.

Since 2007, the SCM Annual Monitoring Area has included 31,496 acres, including the current SCM permit boundary and an approximate 2-mile buffer. Since 2014, SCM has been conducting annual wildlife monitoring in a 31,962-acre area known as the Expanded Monitoring Area, approximately extending from the Crow Indian Reservation boundary on the west to the Tongue River Reservoir to the east. In total, this monitoring area includes the AM5 area and wildlife study area evaluated in this EIS, but also extends approximately two miles north of the wildlife study area (**Figure 3.6-1**). The information presented below was mostly summarized from three annual reports (TWC 2015; TWC 2016; GPWC 2017).

3.6.4.1 Special Status Species

Federally Listed Species

The AM5 area is not within any federally designated critical habitat (USFWS 2017; GPWC 2017). The black-footed ferret (*Mustela nigripes*) is the only species listed by the USFWS as endangered or threatened that occurs in Big Horn County (USFWS 2017). The closest known active or potential ferret reintroduction area is at least 45 miles away (GPWC 2017). Targeted surveys for black-footed ferrets have not been conducted at SCM. Neither ferrets nor their sign (e.g., trenching, scat, tracks) have ever been documented in the vicinity of SCM, or at other regional mines, despite long-term annual wildlife monitoring (diurnal and nocturnal) and periodic targeted ferret surveys conducted in similar habitats elsewhere in the vicinity (GPWC 2017).

Black-footed ferrets are intimately tied to prairie dogs (*Cynomys* spp.) throughout their range and have only been found in association with prairie dogs. Only large complexes (several thousand acres of closely spaced prairie dog colonies) can support and sustain a breeding population of black-footed ferrets, and about 40 to 60 hectares (99-148 acres) of prairie dog colony is needed to support one black-footed ferret (USFWS 2013, MNHP 2017). There are 32 active prairie dog colonies within the wildlife study area (**Figure 3.6-1**). These range in size from under one acre to 236 acres; four colonies are 99 acres or larger. Seven colonies are within, or overlap the AM5 area; one of these seven colonies, a 163-acre colony, is the only one large enough to sustain a single black-footed ferret. There are no complexes large enough to sustain a breeding population of ferrets.

Mitigation of wildlife impacts is addressed in the current Surface Mine Permit (SMP) C1979012 and in other SCM planning documents such as the Species of Special Interest (SOSI) Plan and the Habitat Recovery and Replacement Plan (HRRP). The Wildlife Monitoring Plan (Section 17.24.723 of SMP C1979012) requires black-footed ferret surveys to be performed prior to the disturbance of any black-tailed prairie dog (*Cynomys ludovicianus*) colony. SCM is located outside of any active or potential reintroduction area for this species. Based on available information, the SCM (SMP C1979012) and the proposed AM5 will have no effect on the black-footed ferret or any designated critical habitat for this listed species.

Montana State Species of Concern

Table 3.6-2 lists Montana Species of Concern that have been documented in the wildlife study area or in the SCM Annual or Expanded Wildlife Monitoring areas (TWC 2015, 2016, 2017; MNHP 2017). Species of Concern are native animals breeding in the state that are considered to be at risk due to declining population trends, threats to their habitats, and/or restricted distribution. Designation as a Montana Species of Concern is not a statutory or regulatory classification; the designation is intended to help resource managers make proactive decisions regarding species conservation and data collection priorities.

Table 3.6-2 also indicates if bird species that are protected by the federal MBTA or are listed on the USFWS Birds of Conservation Concern list (species that without additional conservation actions are likely to become candidates for listing under the federal Endangered Species Act).

Seven mammal species, 27 avian species, and eight species of reptiles and amphibians Species of Concern have been documented or are likely to occur in the AM5 permit area; (**Table 3.6-2**) (TWC 2015, 2016; GPWC 2017; MNHP 2017).

Table 3.6-2 Special Status Species Documented in the AM5 Area.				
Common Name	**Scientific Name**	**Status**		**Habitat Requirements**
		USFWS	**Montana**	
Mammals				
Black-tailed prairie dog	*Cynomys ludovicianus*	None	SOC	Grasslands and shrubs
Merriam's shrew	*Sorex merriami*	None	SOC	Arid sagebrush-grassland habitats
Hoary bat	*Lasiurus cinereus*	None	SOC	Forested areas in summer
Townsend's big-eared bat	*Corynorhinus townsendii*	None	SOC	Caves and abandoned mines are used for maternity roosts and hibernacula
Spotted bat	*Euderma maculatum*	None	SOC	Most common in open arid habitats dominated by Utah juniper and sagebrush
Fringed myotis	*Myotis thysanodes*	None	SOC	Desert shrublands, sagebrush-grassland, and woodland habitats (ponderosa pine forest, oak and pine habitats, Douglas-fir)
Little brown myotis	*Myotis lucifugus*	None	SOC	Habitat generalist
Birds				
Baird's sparrow	*Ammodramus bairdii*	MBTA, BCC	SOC	Native prairie and cultivated grasses
Brewer's sparrow	*Spizella breweri*	MBTA, BCC	SOC	Breeds in shrub-steppe habitats dominated by sagebrush

Table 3.6-2 Special Status Species Documented in the AM5 Area.				
Common Name	Scientific Name	Status		Habitat Requirements
		USFWS	Montana	
Green-tailed towhee	*Pipilo chlorurus*	MBTA	SOC	Typically occurs along the ecotone, or edge, of sagebrush communities and other mixed-species shrub communities
Golden eagle	*Aquila chrysaetos*	BGEPA; MBTA; BCC	SOC	Uses cliffs and large trees, occasionally power poles for nesting, and hunt over prairie and open woodlands
Bald eagle	*Haliaeetus leucocephalus*	DM; BGEPA, MBTA,	SOC	Forested areas along rivers and lakes, wetlands, major water bodies, and spawning streams
Ferruginous hawk	*Buteo regalis*	MBTA, BCC	SOC	Mixed-grass prairie, shrub-grasslands, grasslands, grass sagebrush complex, and sagebrush steppe
Burrowing owl	*Athene cunicularia*	MBTA, BCC	SOC	Breeds in open grasslands, in abandoned burrows dug by mammals
Great blue heron	*Ardea herodias*	MBTA	SOC	Nest in cottonwoods along major rivers and lakes, riparian ponderosa pines, and on islands in prairie wetlands
Lewis's woodpecker	*Melanerpes lewis*	MBTA, BCC	SOC	Closely associated with open ponderosa pine forest
Greater sage-grouse	*Centrocercus urophasianus*	None	SOC	Large, contiguous blocks of sagebrush, mesic habitats with forbs and grasses
Sharp-tailed grouse	*Tympanuchus phasianellus*	None	SOC	Grasslands interspersed with shrub and brush-filled coulees

Table 3.6-2 Special Status Species Documented in the AM5 Area.				
Common Name	**Scientific Name**	**Status**		**Habitat Requirements**
		USFWS	**Montana**	
Northern goshawk	*Accipiter gentilis*	MBTA	SOC	Mature large-tract conifer forests with a high canopy cover (69%), relatively steep slope (21%), and little to sparse undergrowth
Peregrine falcon	*Falco peregrinus*	MBTA, BCC	SOC	Nest on ledges of vertical cliffs, often with a sheltering overhang, wide view, near water
Loggerhead shrike	*Lanius ludovicianus*	MBTA, BCC	SOC	Native grasslands and shrublands
Sage thrasher	*Oreoscoptes montanus*	MBTA, BCC	SOC	Breeds in habitats dominated by big sagebrush
Red-headed woodpecker	*Melanerpes erythrocephalus*	MBTA, BCC	SOC	Usually found along major rivers with riparian forest
Black-billed cuckoo	*Coccyzus erythropthalmus*	MBTA, BCC	SOC	Wooded draws, forest edges, thickets, and shelterbelts
Long-billed curlew	*Numenius americanus*	MBTA; BCC	SOC	Native grasslands
Franklin's gull	*Leucophaeus pipixcan*	MBTA	SOC	Large, relatively permanent prairie marsh complexes
Horned grebe	*Podiceps auritus*	MBTA, BCC	SOC	Freshwater ponds and marshes with beds of emergent vegetation
American white pelican	*Pelecanus erythrorhynchos*	MBTA	SOC	Aquatic and wetland habitats, including rivers, lakes, reservoirs, marshes

Table 3.6-2 Special Status Species Documented in the AM5 Area.				
Common Name	Scientific Name	Status		Habitat Requirements
		USFWS	Montana	
Brewer's sparrow	*Spizella breweri*	None	SOC	Sagebrush averaging 16 inches high
Gray-crowned rosy finch	*Leucosticte tephrocotis*	MBTA	SOC	Open situations, fields, cultivated lands, brushy areas, and around human habitation (wintering only)
Pinyon jay	*Gymnorhinus cyanocephalus*	MBTA; BCC	SOC	Open conifer forest
Clark's nutcracker	*Nucifraga columbiana*	MBTA	SOC	Conifer forest
Brown creeper	*Certhia americana*	MBTA	SOC	Coniferous and mixed coniferous-deciduous forests
Veery	*Catharus fuscescens*	MBTA	SOC	Willow thickets and cottonwood stands along streams and lakes
Reptiles and Amphibians				
Greater short-horned lizard	*Phrynosoma hernandesi*	None	SOC	Prairie grasslands and shrublands
Plains hog-nosed snake	*Heterodon nasicus*	None	SOC	Prairie grasslands and shrublands
Western milksnake	*Lampropeltis gentilis*	None	SOC	Arid areas, prairie grasslands and shrublands, floodplains with gravely or sandy soils
Snapping turtle	*Chelydra serpentina*	None	SOC	Backwaters along major rivers, at smaller reservoirs, and in smaller streams and creeks with permanent flowing water and sandy or muddy bottoms

Table 3.6-2 Special Status Species Documented in the AM5 Area.				
Common Name	**Scientific Name**	**Status**		**Habitat Requirements**
		USFWS	**Montana**	
Spiny softshell	*Apalone spinifera*	None	SOC	Primarily a riverine species, occupying large rivers and river impoundments, but also occurs in lakes, ponds along rivers, pools along intermittent streams
Plains spadefoot	*Spea bombifrons*	None	SOC	Grasslands and shrublands near seasonal water
Great Plains toad	*Anaxyrus cognatus*	None	SOC	Sagebrush-grassland habitats
Northern leopard frog	*Lithobates pipiens*	None	SOC	Low elevation and valley bottom ponds, lakes, creeks, marshes

Sources: TWC 2015, 2016; GPWC 2017; MNHP 2017.

SOC: Species of Concern; BGEPA: Bald and Golden Eagle Protection Act; DM: Delisted, Monitoring; MBTA: Migratory Bird Treaty Act; BCC: Birds of Conservation Concern.

3.6.4.2 Big Game

The most common big game species that occur in the wildlife study area are mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocapra americana*). White-tailed deer (*O. virginianus*) are present but are rare; they were only recorded on 3 of the last 22 big game winter surveys.

In 2016 winter surveys, approximately 50 mule deer in 12 herds were observed. Deer were observed most often in sagebrush-grassland, with native grasslands and ponderosa pine-juniper woodlands the second most common habitat types. Mule deer were observed throughout the survey area. Individual deer did not concentrate in large numbers at any specific location, however they were observed more often immediately north of the SCM permit area and in the south-central part of the wildlife monitoring area (TWC 2016). Those locations are characterized by a mixture of ponderosa pine, rough breaks, and sagebrush-grassland habitats. Prior to 1999, wintering deer were routinely observed around the mine facilities, in reclamation, and in native habitats within the permit area. Fewer deer were documented within the permit area in recent years, perhaps in response to an increase in mine related activities over time (TWC 2016).

Although aerial surveys for wintering big game have been conducted annually since 1989, survey methods and data protocols varied over time making it difficult to develop trend data. The differences in numbers of deer observed between years could have been due to weather, seasonal movements, changes in visibility or factors other than real population changes. Population density estimates for mule deer from 1995 through 2011 ranged from 0.8 to 9.6 mule deer per square mile with no obvious data trends (GPWC 2017). From 2012 through 2016 population density averaged 1.4 deer per square mile, and from 2014 to 2016, density estimates ranged from 0.6 (2016) to 3.1 (2015) (GPWC 2017).

Eight herds of pronghorn totaling 184 animals (average of 3.7 animals per square mile) were observed in the SCM monitoring area during the 2016 winter aerial survey (GPWC 2017). Pronghorn were most often seen in sagebrush-grassland, followed by reclaimed grassland and native grassland. The majority of the animals detected were in the northeastern portion of the monitoring area. Pronghorn have typically been less abundant than mule deer on aerial surveys, with the exception of some years (i.e., 2015 and 2016). The population density estimate for pronghorn from 1995 through 2011 ranged from 0.6 to 6.5 animals per square mile. Densities from 2012 through 2016 ranged from 0.2 to 3.7 pronghorn per square mile. Pronghorn densities generally increased from 1995 through 2010, then declined until 2015 (GPWC 2017).

Most of the wildlife study area is considered high value big game winter habitat by MFWP (MFWP 2018). No big game migration corridors have been identified in the SCM permit area or larger monitoring area.

3.6.4.3 Upland Game Birds

Game birds observed in the AM5 area include sharp-tailed grouse, greater sage-grouse, mourning doves (*Zenaida macroura*; regularly seen in multiple habitats across the entire monitoring area), and gray partridge (*Perdix perdix*; seen on several occasions).

Sharp-Tailed Grouse

Sharp-tailed grouse *(Tympanuchus phasianellus)* are found throughout the AM5 project area, but appear to be more prevalent in the northern portion of the wildlife study area, based solely on the location of the active leks documented by SCM (GPWC 2015). This may be due to more rolling grassland habitat, resulting from reclaimed mining, wildland or prescribed fires, sagebrush poisoning, or a greater amount of adjacent cropland. The AM5 area may not be considered high quality habitat due to the large percentage of shrublands and lack of mixed-grass/shrubland habitat (Flake et.al. 2010). However, sharp-tailed grouse are routinely observed and several leks are present within the lands owned or controlled by SCM. Fifteen sharp-tailed grouse dancing grounds (leks) are monitored annually by SCM's wildlife contractor. Of these 15 leks, three inactive and two active leks are within the wildlife study area. Lek identifiers are assigned by species abbreviations, thus sharp-tailed grouse leks are identified by "ST". Lek ST-2 is located approximately 0.25 miles west of the AM5 boundary. This lek had no males present in 2015 and eight males in 2016. The other active lek (ST-8) is located approximately 1.75 miles northwest of the AM5 area. This lek had 27 males present in 2015 and 19 in 2016.

Sharp-tailed grouse populations appear to be somewhat cyclic. Population variations are affected by spring precipitation, winter snow conditions, drought and agricultural practices. Sharp-tailed grouse do not tend to have the same fidelity to lek sites as do greater sage-grouse. It is not uncommon for sharp-tailed grouse to move leks if the previous lek is disturbed or destroyed, or even when no apparent disturbance has occurred (Flake et al. 2010).

Greater Sage-Grouse

The Western Association of Fish and Wildlife Agencies identified seven Sage-Grouse Management Zones for assessing population and habitat trends independent of administrative and jurisdictional boundaries. The AM5 project area is located in Management Zone One (MZ1) – Great Plains (Knick and Connelly 2011). Greater sage-grouse population zones were then delineated within each MZ, with the AM5 area being part of the Powder River Population Zone (Garton et al. 2011).

Populations of greater sage-grouse have experienced a long-term decline throughout their range of about 2 percent per year from 1965 to 2003 (Knick and Connelly 2011). Within MZ1, from 1970 to 2007 the number of active leks decreased from the total observed pre-1970 to 90 percent in 1970-74, then dropped to 66 percent in 2000-2007 and the average number of males per lek declined by 45 percent during this same period. Garton et al. (2011)suggests the population of male greater sage-grouse within MZ1 was approximately 76,000 in 1969 and was estimated at 5,397 males in 2007. A common and often accepted belief is greater sage-grouse populations are cyclic and in some instances the patterns in lek counts can be attributed to the cyclic nature of these populations (MDNRC 2014). However, no peer-reviewed publications have provided compelling evidence that greater sage-grouse populations are cyclic (Johnson et al. 2011).

MFWP worked with conservation and science partners to develop the *Management Plan and Conservation Strategy for Sage Grouse in Montana – Final in 2005*. The goal of this plan is to, "provide for the long-term conservation and enhancement of sagebrush steppe/mixed grass prairie complex within Montana in a manner that supports greater sage-grouse and a healthy diversity and abundance of wildlife species and human resources." The plan describes the desired conditions for greater sage-grouse habitat, and identifies risks confronting habitat and greater sage-grouse populations based on the best available information at the time. Emerging science, especially related to energy development, was used in conjunction with the *Management Plan* in the development of the Montana Sage-grouse Habitat Conservation Program in 2014. While the new program establishes a regulatory framework for activities in greater sage-grouse habitat, the management plan remains the most comprehensive document on greater sage-grouse population dynamics and habitat requirements in Montana (MFWP 2017).

The entire AM5 area is within greater sage-grouse habitat as determined by MFWP (MDNRC 2014). Core Areas were delineated by MFWP in cooperation with federal and non-governmental partners to encompass the areas with the greatest number of displaying males and associated habitat (MDNRC 2014). The remaining portion of the AM5 area is within greater sage-grouse General Habitat. Core Areas are dominated by Wyoming big sagebrush, western wheatgrass and bluebunch wheatgrass (Section 3.5.2.1). Within this habitat type, several black-tailed prairie dog colonies are present (Section 3.6.2). Although lacking the density of sagebrush typical of nearby undisturbed sites, these areas provide important greater sage-grouse habitat.

Altogether, areas delineated by MFWP as Core Areas contain about 76 percent of the breeding males in Montana according to 2012 lek counts. Because these sagebrush habitats comprise the best and most important areas to conserve greater sage-grouse, stipulations and conditions for development are most conservative in Core Areas. Stipulations and conditions are designed to maintain existing levels of suitable greater sage-grouse habitat by regulating uses and activities in Core Areas to ensure the future abundance and distribution of greater sage-grouse in Montana.

General Habitat areas are also important to greater sage-grouse and critical to the effort to maintain the abundance and distribution of greater sage-grouse in Montana. These areas may also include leks and nesting areas, but at a lower density than Core Areas. Development scenarios in General Habitat are more flexible than in Core Areas, but must still be designed and managed to maintain populations, habitats, and essential migration routes. This is because Montana's Conservation Strategy must assure habitat connectivity and movement between populations in Core Areas (MFWP 2017).

Researchers have determined relatively large blocks (10,000 acres minimum) of intact sagebrush habitat are critical to successful reproduction and overwintering survival (Connelly, Rinkes, and Braun 2011). The discussions in this document are generally focused around leks and nesting or brood rearing habitat. Loss of quality nesting and brood rearing habitat has been cited as an important factor in the decline of greater sage -grouse populations (Connelly and Braun 1997, Crawford et al. 2004, Atamian et al. 2010). Greater sage-grouse hens nest and rear their broods near leks. The mean distance from lek of capture to nest site ranged from 2.5 km to 8.6 km in studies of female bird movements conducted in Wyoming and Montana (summarized in Connelly et al. 2011). Hens rear their broods in the vicinity of their nest for several weeks after their chicks hatch (Berry and Eng 1985, Connelly et al. 2000). Juvenile birds experience much higher mortality rates compared to adult birds. The annual survival rate of breeding age females has been estimated at over 60percent while the estimated survival rate of juveniles to their first breeding season is 10 percent (Crawford et al. 2004).High quality breeding, nesting, and brood-rearing habitat are critical to the reproductive success of greater sage-grouse.

Greater sage-grouse General Habitat generally does not support the density of Wyoming big sagebrush as compared to the adjacent Core Areas (GPWC 2015). Gently rolling areas are dominated by grasses, such as western and bluebunch wheatgrass, prairie sandreed, Kentucky and Sandberg bluegrass, blue gramma, buffalograss, needle and thread, green needlegrass and sedges (TWC 2017). Both gentle and steeper slopes in General Habitat support ponderosa pine and Rocky Mountain juniper. The steeper slopes also support lesser amounts of shrub species such as Wyoming big sagebrush, rubber rabbitbrush and skunkbush sumac. General Habitat adjacent to Pearson, Young, Squirrel, and Dry Creeks are typical of this habitat type.

Some of major drainages, such as Youngs and Squirrel Creeks support a diversity of deciduous trees, including green ash, box elder, Great Plains cottonwood, chokecherry, various willow species, red osier dogwood, gooseberry, golden current, silver sagebrush and on some sites, Rocky Mountain juniper. Research conducted within the Powder River Basin, including the AM5 project area, found greater sage-grouse largely avoid wooded riparian habitats (Doherty, Naugle, and Walker 2010). Non-wooded riparian areas were generally avoided, although broods did utilize this habitat, especially during late summer.

SCM has conducted wildlife surveys throughout the mine permit area and a two-mile buffer since 1982. Additional properties adjacent to the southeast permit area were added to the survey area in 2006 (TWC 2016). In addition, MFWP and the BLM Miles City Field Office have monitored wildlife within and adjacent to the AM5 area, with the past ten years being focused on greater sage-grouse. All of the leks associated with the AM5 project area and monitored by SCM occur within Core Areas.

Lek location and attendance in the vicinity of the Proposed Action are well documented; however, little is known about the location and condition of other habitats for this population, such as late summer or winter habitat. Greater sage-grouse display a variety of annual migratory patterns from very little seasonal movement to seasonal movements exceeding 75 km (Connelly et al. 2000). SCM's approved wildlife monitoring plan does not include any greater sage-grouse monitoring from late summer through late winter. In general, greater sage-grouse use large expanses of sagebrush with gentle topography during the winter (Doherty et al. 2008, Beck 1977). Large expanses of sagebrush with areas of gentle topography occur in the haul road corridor, indicating that some of the area disturbed by the Proposed Action could be suitable winter habitat. Greater sage-grouse were found to avoid energy development when selecting winter habitat (Carpenter et al. 2010, Doherty et al. 2008). CBM development has occurred in recent years throughout the Powder River Basin, including in the vicinity of the Proposed Action. Greater sage-grouse may also avoid areas where energy development has occurred during other seasons (Walker et al 2006, Doherty et al 2008, Carpenter et al 2010). While data on late summer and winter habitat use by greater sage-grouse in the vicinity of the Proposed Action are lacking, some conclusions can be drawn. Suitable winter habitat, identified based on vegetation and topography, is present in the vicinity of the Proposed Action. Birds may avoid areas where recent CBM development has occurred.

Beginning in 2003, BLM, the Department of Energy (DOE), Fidelity Exploration Inc., University of Montana, and other agencies and organizations conducted research on greater sage-grouse within the Powder River Basin, including within the AM5 area. Some of the pertinent findings from this research include documentation of avoidance of conifers by greater sage-grouse and impacts of West Nile virus (WNv) (Blickley et al. 2012).

West Nile virus was first determined to be a potential threat to greater sage-grouse in 2002, with confirmed mortalities in an area just south of the AM5 project area. Early indications suggested West Nile virus was 100 percent lethal to greater sage-grouse. More recent finding has indicated that resistance to West Nile virus, although low, may be increasing. The primary vector of West Nile virus is the mosquito *Culex tarsalis*. *Culex tarsalis* prefers sites with submerged vegetation and warm standing water, including ephemeral puddles, vegetated pond edges and hoofprints (Walker and Naugle 2011). Although there are no records of greater sage-grouse mortalities within the AM5 project area resulting from West Nile virus, with previous West Nile virus outbreaks within the Powder River Basin, it is reasonable to expect greater sage-grouse may have been impacted.

The AM5 area has been monitored for the presence of greater sage-grouse leks generally multiple times annually, although variation in the monitoring interval does occur (MFWP 2017). Leks which are part of the SCM scheduled monitoring, have been surveyed at least three times annually. Other leks, such as the two Ankney leks and BI-012 lek were generally monitored three times per year by BLM and MFWP personnel during the time when coalbed natural gas development was ongoing. Once the coalbed natural gas sites ceased to operate, lek monitoring was reduced or eliminated. There are 11 recorded leks designated as active, inactive, or unconfirmed within two miles of the AM5 project area. Lek status is defined as follows (MDNRC 2014):

Table 3.6-3. Lek Status Designations (MDNRC 2014).

Designation	Description
Active	Data support evidence of leks. Supporting data defined as one year with two or more males lekking on site followed by evidence of lekking within 10 years of that observation.
Inactive	A confirmed active lek with no evidence of lekking for the last 10 years. Requires a minimum of three survey years with no evidence of lekking during a 10-year period.
Extirpated	Habitat changes have caused birds to permanently abandon a lek as determined by the biologist monitoring the lek.
Unconfirmed	Possible lek. Sage grouse activity documented. Data insufficient to classify as active status.

The 11 leks are summarized in **Table 3.6-4**. Five of the 11 leks are not found on the MFWP lek summary sheets. However, all 11 leks were monitored by SCM as recently as 2016. Due to their relative proximity to one another, it is possible the actual number of active leks may be less than 11. A review of lek status is warranted, but has not been completed (Ensign 2018). Since 2015, greater sage-grouse have been present at the Pasture, Playa, and Alternative Fenceline Playa during at least one year. The remaining leks have not had greater sage-grouse present for several years, although most had lekking activity within the past ten years (TWC 2015). Lekking activity within the AM5 area has been minimal for the past five years. The Ankney South and North leks were reported to have greater sage-grouse present as recently as 2011. Monitoring conducted since 2012 found no greater sage-grouse using these leks. Lek BI-012 has not had birds present since 1988 (GPWC 2015).

Three leks monitored by SCM were not included in **Table 3.6-3**. HW26 does not occur in the MFWP database, and this lek is considered unconfirmed. Although access to monitor HW26 lek has not been granted by the landowner, SCM has attempted to monitor the lek from a distance. No birds were observed at HW26 lek from 2008 through 2016. The Corral lek (BI-07/07A) is located approximately five miles northeast of the AM5 project area and is considered to be inactive. The West Bench lek (BI-002) is over two miles from the AM5 project area. The last year the West Bench lek had birds present was in 2007, and it has recently been reclassified as inactive by FWP based on 2017 survey results (GPWC 2017; MFWP 2017, Ensign 2018b).

Table 3.6-4. Summary of Greater Sage-Grouse Lek Activity within the AM5 Area Through 2017

Lek Name	MFWP BI#	2017 Monitoring Male/ Female	Years Monitored 2007-2017	Last Year Males Observed	Approximate Distance from AM5 Corridor (Miles)	Current Management Status[1]
Windmill (No BI#)	No BI#	0/0			<0.1	Inactive
Pasture	BI-005	0/0	All	2015(05)	0.2	Active
Alternate Pasture	BI-005A	0/0	2008-2011	2012 (11)	0.8	Active
Playa (BI-006)	BI-006	0/0	All	2016	0.7	Active
Fenceline Playa[2]	No BI#	0/0	All		1.3	Active
Alternate Fenceline Playa	No BI#	2/1	All	2016	1.4	Unconfirmed
Fenceline Playa II	BI-010A	0/0	All	2009	1.2	Active
Sec 20 – Unconfirmed	BI-028	0/0	2006-2017	2006	1.8	Unconfirmed
BI-012	BI-012	0/0	All	1988	1.2	Unconfirmed
Ankney North	BI-011	0/0	All	2011	0.4	Active
Ankney South	No BI#	0/0		2010	0.5	Active

1. As defined by Montana's Greater Sage-grouse Habitat Conservation Advisory Council (2014): **Active:** at least two males present in at least one year followed by fresh sign within 10 years of that observation; **Inactive:** no males present for last 10 consecutive years; **Unconfirmed-**Possible lek: grouse activity documented but insufficient data to classify as active.
2. Fenceline Playa overlaps the Playa (BI-006) lek and is considered part of the Playa lek in some surveys and reports.

Few sightings of greater sage-grouse outside of lek surveys have occurred. SCM has surveyed brood habitat as part of annual monitoring since the mid-1970s for most of the northern portion and the southern portion since 2003 (TWC 2016). Occasional greater sage-grouse have been observed, but not to a level to suggest greater sage-grouse regularly use habitats within and directly adjacent to the AM5 area. For example, three non-lekking greater sage-grouse were observed in 2014. No broods have been observed since 1999-2000. Although not specifically monitored, no wintering greater sage-grouse have been observed during the big game winter surveys from 1995 through 2016 (GPWC 2017).

The following summarizes data collected by SCM and its contractors from 1990 to 2017 (GPWC 2017). Greater sage-grouse within and adjacent to the SCM properties have experienced a long-term decline. Especially low male greater sage-grouse numbers occurred through the mid-1990s and from 2009 through 2014, with slightly higher numbers in 2015-16 (most recent survey years). Despite occasional minor increases in greater sage-grouse populations, peak counts were below the long-term average of 4.1 males per lek during 27 of the last 37 years. In 2013-14, no sage grouse were observed on any of the monitored leks. In 2015-16, male attendance was 0.3 males/lek, well below the long-term 4.1 males/lek (GPWC 2017). Monitoring in 2016 found only two leks within two miles of the AM5 area were attended by greater sage-grouse. Some leks have had birds present within the past ten years, and are classified as active. This use does not appear to be annual and cumulative counts are less than five birds/lek/year). The future of greater sage-grouse in this area is unknown. Past and current energy development and the associated infrastructure, conifer and cheatgrass invasion, West Nile virus, drought, and current grazing management may all impact greater sage-grouse and their habitats in the future. The lack of greater sage-grouse use in this area may be attributed to multiple factors including but not limited to outbreaks of West Nile virus, cheatgrass or conifer invasion, drought, grazing management practices which may degrade important nesting and brood rearing habitats, habitat loss or fragmentation, a network of roads and trails needed to support energy development and ranching operations, coalbed natural gas infrastructure, numerous fences, pipelines and powerlines, a state highway and railroad, and noise associated with mining, oil and gas development, highway travel, and the railroad. One lek (Playa) was inundated for several years with water produced as a result of coalbed natural gas development. This lek was active prior to being inundated with water, but has had minimal activity since (TWC 2016).

Livestock grazing occurs throughout the sage-grouse range but has a more diffuse influence on soils and vegetation in contrast to land uses that remove or fragment habitat (Knick and Connelly 2011). Livestock grazing has historically occurred on the

CX Ranch and on properties adjacent to the SCM. However, in more recent years, some of the pastures directly adjacent to active mining have not been grazed (TBGPEA 2017).

Other Upland Game Birds

Other game birds observed include mourning doves (*Zenaida macroura*; regularly seen in multiple habitats across the entire monitoring area) and gray partridge (*Perdix perdix*; seen on several occasions).

3.6.4.4 Regulatory Environment for Greater Sage-Grouse

Montana Sage Grouse Habitat Conservation Program

The Montana's Greater Sage-Grouse Habitat Conservation Advisory Council (MDNRC 2014) established multiple sage-grouse Core and Connectivity Areas across the state. Two areas within Core Area 12 overlap the AM5 area: PRB-1 (south area) and PRB-2 (north area) (**Figures 3.6-1 and 3.6-2**). Information on how Core Area characteristics and their designation are discussed in Section 3.6.2.3.

The Montana Sage Grouse Habitat Conservation Program (MSGHCP) (https://sagegrouse.mt.gov) is based on the collaborative efforts of the Advisory Council. The 2015 Montana Legislature passed the Greater Sage Grouse Stewardship Act and Governor Bullock signed Executive Orders 12-2015 and 21-2015 (EOs).

The Sage Grouse Habitat Conservation Program (Program) was created to facilitate implementation of the EOs across state government, including private entities, such as CPE, seeking to develop projects in key greater sage-grouse habitats. The Program is overseen by the Montana Sage Grouse Oversight Team (MSGOT).

The EOs require the Program to review all proposed activities, such as the AM5 haul route, in greater sage-grouse habitats designated as Core Areas or General Habitat. The EOs guide where and how developments occur in these designated areas. Limitations, stipulations, or conditions may apply, depending on the project or activity. Other components establish general practices. Mitigation may be required. The EOs apply to all programs and activities of state government, including permitting. The program may require compensatory mitigation for impacts that cannot be avoided, minimized or restored. Section 2.4.1 describes the process that the Program, SCM, and DEQ have used to develop a mitigation plan based on their review of the proposed AM5 haul road. **Appendix B** contains the complete plan.

Thunder Basin Grasslands Prairie Ecosystem Association

CPE, as a member of the Association, has submitted a list of Conservation Strategies they intend to implement as a part of the AM5 project (Arrowhead I LLC, CI/CP Application, Attachment 3 2017). See Section 1.5 for a description of these strategies. Section 2.23 and **Table 2.2-1** also describe the contents of the CI/CP.

3.6.4.5 Raptors

Raptor species nesting in the wildlife study area include red-tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), osprey (*Pandion haliaetus*), golden eagle, and great horned owl (*Bubo virginianus*). Active raptor nests in the smaller AM5 area, based on 2014 wildlife data (Figure 312, SCM AM5 Permit Application), belonged to two red-tailed hawks, one great-horned owl, and four prairie falcons. The Proposed Action route will not physically impact any known raptor nests and is at least 0.5 mile from known golden eagle nests. Inactive nests in the AM5 area were found for eight red-tailed hawks and one great-horned owl. Red-tailed hawks are the most common nesting raptor in the wildlife study area, followed by prairie falcons.

Bald eagles are common winter residents in the region and were regularly seen on winter roost surveys in the wildlife study area. Bald eagles were mostly associated with larger cottonwood galleries along Squirrel or Youngs Creeks.

In addition to protection afforded them under the MBTA, bald and golden eagles are also protected under the BGEPA (16 U.S.C. 668–668d). The act prohibits, among other things, the take of eagles, and defines “take”, to include “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb”. The term “disturb” is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury to an eagle, a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior.

3.6.4.6 Other Wildlife

SCM conducted waterfowl and shorebird surveys in the northern portion of the wildlife study area, but because of limited habitat these birds are not abundant. No surveys were conducted in the southern portion of the wildlife study area, but habitat there is even more limited.

Bat monitoring indicated that there are approximately eight bat species, four of which are Species of Concern (**Table 3.6-2** Townsend’s big-eared bat was not found during SCM monitoring, but did show up in the MNHP search [2017]) in the wildlife study area, and numbers are highest in June through August. The riparian areas in the AM5 area provide good foraging habitat for many bat species and the larger trees likely provide roosting habitat (GPWC 2017).

Amphibian and reptile species recorded on monitoring surveys from 2014 to 2016 were boreal chorus frog (*Pseudacris triseriata,* most common), northern leopard frog, Woodhouse’s toad (*Anaxyrus woodhousii*), painted turtle (*Chrysemys picta*), greater short-horned lizard (*Phrynosoma hernandesi*), gophersnake (*Pituophis catenifer*), prairie rattlesnake (*Crotalus viridis*), and terrestrial garter snake (*Thamnophis elegans*). Northern leopard frogs and greater short-horned lizards are Species of Concern (**Table 3.6-2**). All but Woodhouse's toad and gophersnake are associated with riparian and wetland habitats (TWC 2015, 2016; GPWC 2017).

Incidental wildlife observations of mammals from 2014 to 2016 included coyote (*Canis latrans*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), and black bear (*Ursus americanus*). Bird species observed included common raven (*Corvus corax*), American crow (*Corvus brachyrhynchos*), brown thrasher (*Toxostoma rufum*), Bullock's oriole (*Icterus bullockii*), white-crowned sparrow (*Zonotrichia leucophrys*), American white pelican, house wren (*Troglodytes aedon*), Hammond's flycatcher (*Empidonax hammondii*), loggerhead shrike, and pinyon jay, and various other songbirds (TWC 2015, 2016; GPWC 2017). American white pelican, loggerhead shrike, and pinyon jay are all Species of Concern (**Table 3.6-2**).

3.6.5 Environmental Consequences

3.6.5.1 No Action Alternative

Under the No Action Alternative, the AM5 permit amendment would not be approved and ongoing land uses would continue. Impacts to wildlife directly related to the AM5 project under this alternative would not occur.

The Thunder Basin Grassland Prairie Ecosystem – Certificate of Inclusion and Certificate of Participation and associated Conservation Measures (See Map Attachment 3 in TGPEA 2017) would be implemented as a part of all three alternatives (Section 2.2.3). The amount of land enrolled by CPE in these measures in Montana is approximately 28,700 acres.

CI/CP Conservation Actions - Greater Sage-Grouse

Two conservation easements, totaling 700 acres, would be established in Core Areas, northwest of the AM5 project area. The conservation easements would be in place for a minimum of 30 years. In total, these conservation easements are approximately three miles of the AM5 project area. Protecting Core Areas would provide long-term habitat for greater sage-grouse. Anthropogenic disturbances associated with coal mining would not occur. With or without the conservation easements, stressor such as drought, West Nile virus and fire are still possible. Preserving high quality habitat has been identified as one of the greatest needs to maintain greater sage-grouse in EO-12-2015 and would follow the Sage Grouse Program's sequencing standard.

Management of invasive species, including conifer removal on up to 8,823 acres, treating up to 80 collective acres of areas burned by wildfire, and reseeding 0.75 mile of roads with native seed mix within three miles of greater sage-grouse leks would be implemented as part of the CI/CP.

Rangewide, fire can and has resulted in major alterations of greater sage-grouse habitats. Fire and other disturbances resulted in a direct loss or fragmentation of greater sage-grouse habitat throughout its range. Multiple researchers believe the most important ecological restoration needs in sagebrush are to control invasive species and restore the diversity and cover of native plants while retaining sagebrush cover, so the ecosystem has the capacity to resist fire and recover after fire and other disturbances (Baker 2011).

Removal of 8,823 acres of conifers scattered amongst numerous parcels could result in benefits to greater sage-grouse habitats and positively influence population responses. Influencing the effectiveness of these treatments could be at least partially dependent on whether adjacent state or federal lands are treated.

Measuring efficacy of restoration treatments is a desired goal of adaptive management, and studies have documented positive greater sage-grouse responses to mechanical removal of conifers. In a before and after control-impact study, nesting hens in southern Oregon were quick to use restored habitats made available by conifer removal. Within three years of initiating treatments, 29 percent of the marked females were nesting within and near restored habitats; no such response was apparent in the nearby control landscape where conifers were not removed (Severson et al. 2017). Relative probability of nesting in newly restored sites increased by 22 percent annually, and females were 43 percent more likely to nest near treatments. In northwest Utah, most hens (86 percent) avoided conifer-invaded habitats and those using restored habitats were more likely to raise a successful brood (Severson et al. 2017). Taken together, studies show that conifer removal can increase habitat availability for nesting and brooding greater sage-grouse.

Other studies examined whether benefits from conifer removal conducted for greater sage-grouse extend to sagebrush dependent songbirds. In southern Oregon, abundances of Brewer's sparrow (*Spizella breweri*), and vesper sparrow (*Poocetes gramineus*) more than doubled following mechanical conifer removal. Annual increases each year post tree removal suggest that Brewer's sparrow use may increase even more with time. Findings illustrate that conifer removal conducted for sage-grouse that retained shrub cover can result in immediate benefits for other sagebrush birds of high conservation concern (Miller et al. 2017).

Enhancing water and green area availability by the establishment of three water guzzlers or other ground level watering devices and protection of these areas from trampling livestock would protect riparian/mesic areas known to be important to greater sage-grouse. Mesic areas comprise a small portion of the landscape (2.4 percent in the Great Basin), but breeding populations of greater sage-grouse were found to increase nearer mesic area. Sustainability of scarce water resources hinges on maintaining land use practices that promote conservation of mesic resources (Donnelly et al. 2016).

Selective removal of 2.35 miles of fence could positively impact greater sage-grouse by reducing collisions. The distance between a lek and fences, as well as topography, can influence the potential for strikes. Although research has largely been focused on collisions by greater sage-grouse moving to and from leks, wintering birds could also be impacted. In southern Idaho, radio collared greater sage-grouse annual mortality resulting from fence collisions were estimated at approximately 0.25 birds per mile of fence (one mortality for every four miles of fence). Removal of fencing, depending on distance from a lek and topography, could reduce collision potential (Stevens et al. 2013).

3.6.5.2 Proposed Action Alternative

Under the Proposed Action Alternative, there would be approximately 970 acres of wildlife habitat lost during construction and operation (**Table 2.3.1**), including the 303-acre road surface. Most disturbed areas, excluding the road surface will receive some level of reclamation in the form of reseeding. Upon mine closure in 2030 or 2031, the AM5 haul road would be closed and the area reclaimed. There would be a permanent loss of the sandstone outcrops, clay cliff faces, and other topographic features, as these will not be restored. Sagebrush and trees would gradually re-establish on the reclaimed land but losses of these habitats would persist for longer than grassland communities. Virtually all the wildlife species present would be affected to some degree by these losses as the area would have a reduced carrying capacity during the life of the project and a permanent reduction in some habitat features, and thus a reduction in wildlife diversity.

Wildlife would be subjected to road kills by construction, operation, and maintenance-related traffic on the AM5 haul road. The low traffic speeds and volume [average of 16 mph and a passage frequency of 4 haul trucks and 1.4 support vehicles per hour] on the AM5 road would, however, minimize road kills during normal road operations. Wildlife would be displaced from the AM5 area due to disturbance during construction, operation, and reclamation.

Restrictions on wildlife movement and habitat fragmentation created by the nine-mile-long road, including road berms and culverts, would be one of the largest impacts of the Proposed Action Alternative. Most of the research on the effects of roads on wildlife populations is in relation to highways which tend to have higher traffic volumes and traffic speeds than the Proposed Action. However, the width of the area affected by the Proposed Action (average road width of 296 feet and maximum width of 600 feet) is much greater than for most highways (in Montana a four-lane divided highway would likely be about 120 to 150 feet wide). The sides of the roadway berms would be constructed at a slope of approximately 27 degrees, which although passable by wildlife, would create an obstacle in their usual migratory pathways along the riparian corridors. Highways and roads cause barrier effects resulting in diminished habitat connectivity, blocking animal movements between seasonal or daily use of habitats, reducing genetic interchange (Epps et al. 2005, Gagnon et al. 2011), limiting dispersal of young (Beier 1995), and disrupting viable wildlife population processes (see also Section 4.4.5). The Proposed Action includes four large culverts at the four largest stream crossings. The width of the road base at these crossings ranges from 386 to 668 feet; with culvert diameters ranging from 10 to 22 feet. There is little or no research on wildlife using crossing structures of this length, especially without any openings for light to penetrate; thus it is unknown if these culverts will facilitate non-aquatic wildlife passage.

Medium-sized mammals (such as coyotes, foxes, skunks, and raccoons) would be displaced to other habitats, potentially resulting in increased competition and mortality. Direct losses of small mammals, reptiles, and amphibians would be higher than for other wildlife, since the mobility of small animals is limited and many spend time in burrows. Therefore, populations of such prey animals as voles, mice, chipmunks, prairie dogs, and rabbits would decline for the life of the project. However, these animals have a high reproductive potential and would likely recolonize when reclamation was complete.

Greater Sage-Grouse

Construction of AM5 haul road could result in the direct loss of young greater sage-grouse or nests, depending on the time of construction. Since greater sage-grouse can initiate nesting in March and extend into mid-July, restricting vegetation removal during this time period would minimize or eliminate nests being lost. SCM has committed to the extent possible to minimize disturbance activities during the breeding season, resulting in reduced direct mortality.

Long-term loss (>10 years) of greater sage-grouse habitat would result from implementation of the AM5 proposed alternative. Of the 970 acres of direct disturbance, 441 are within greater sage-grouse Core Areas and the remainder are within General Habitat. Due to the magnitude of the disturbance, (average 293 -foot running width, berms, cuts and fills, high voltage distribution line, overhead lights, and spoil piles coupled with regular truck activity), it is anticipated that greater sage-grouse will largely vacate the AM5 disturbance corridor. The proposed elevated high voltage distribution line and light posts will impact greater sage-grouse, especially in previously non-fragmented habitats. Greater sage-grouse avoid elevated structures, partially because power poles provide perches for raptors such as great horned owls and golden eagles. Greater sage-grouse collisions with high voltage distribution lines have been documented.

Greater sage-grouse may avoid the nine mile AM5 corridor, plus a buffer adjacent to the corridor during all phases of the proposed project. Research has shown that due to the high degree of fidelity greater sage-grouse have to nesting and other habitats, the older birds, present before and during construction will likely try to use habitats they have used historically. If this includes the AM5 area and/or adjacent buffer areas, the birds which have historically used the habitat may continue to do so despite its lower quality and increased risk of predation. At some point this population of birds will likely die out. However, young produced adjacent to the disturbance corridor and during or after construction, because they have not established fidelity to habitats are far more likely to move away from the disturbance corridor and would be less likely to use the corridor in the future. Studies have documented impacts of oil and gas development out to distances of 3.7 miles. Naugle et al. (2011) conducted a study in the Powder River Basin which found that when natural gas development exceeds one well pad per square mile, impacts to breeding populations were discernable and densities of eight pads per square mile exceeded the species threshold of tolerance. This same review found that from 2001 to 2005 lek count indices inside gas fields declined by 82 percent, whereas indices outside development declined by 12 percent. By 2004-2005, 38 percent of leks inside of gas fields remained active, whereas 84 percent of leks outside of development remained active (Naugle et al. 2011). Although specific to impacts of oil and gas development, this Naugle study (2011) further suggests greater sage-grouse have little ability to adapt to change.

The AM5 corridor would result in a barrier to movement and habitat fragmentation. Creation of a large and elevated road with steep berms, multi-strand wire fence, stockpiles of topsoil, lights mounted on vertical poles, posts and an overhead high voltage distribution line may eliminate or restrict greater sage-grouse movements.

Habitat fragmentation has the potential to affect multiple life stages of greater sage-grouse. Fidelity to leks has been well documented in greater sage-grouse populations and is more characteristic of adults than juveniles in a population. In addition, researchers have also documented fidelity of females to nesting habitat. The distance between a female's nest in consecutive years was a median of 0.4 mi. (range = 0.0-1.6 mi.). Linear disturbances such as a highway and/or power line may effectively divide a population (Connelly, Hagen, and Schroeder 2011).

Research has shown male greater sage-grouse lek attendance declines when consistent noise levels exceed 10 decibels over background or ambient conditions (Blickley et al. 2012, Walker et al. 2007). Noise associated with construction and reclamation of the transportation corridor is anticipated to exceed greater sage-grouse tolerance (see Section 3.13 and **Table 3.13-7**).

Lek location and attendance in the vicinity of the Proposed Action are well documented; however, little is known about the location and condition of other habitats for this population, such as late summer or winter habitat. Greater sage-grouse display a variety of annual migratory patterns from very little seasonal movement to seasonal movements exceeding 46 miles (Connelly et al. 2000). SCM's approved wildlife monitoring plan does not include any greater sage-grouse monitoring from late summer through late winter. Large expanses of sagebrush with areas of gentle topography occur in the haul road corridor, indicating that some of the area disturbed by the Proposed Action could be suitable winter habitat. While data on late summer and winter habitat use by greater sage-grouse in the vicinity of the Proposed Action are lacking, some conclusions may be drawn. Suitable winter habitat, identified based on vegetation and topography, is present in the vicinity of the Proposed Action. Birds may avoid areas where recent CBM development has occurred.

The AM5 haul road plan has several associated components which deviate from EO 12-2015. These areas of potential deviation are identified in **Table 3.6-4** below. In addition to each potential deviation, discussion has been provided to as to why the component may not be compliant. Distances from active leks to the AM5 corridor are identified in **Table 3.6.3.**

Table 3.6-4 Deviations of the AM5 Haul Route Project from Montana EO 12-2015 Stipulations

EO 12-2015 Reference & Description	EO Language	Discussion
Attachment D – Core Area Stipulations (as amended)		
1. Surface Disturbance	Within Core Areas, surface disturbance will be limited to no more than 5 percent of greater sage-grouse habitat averaged across the area affected by the project.	The Density/Disturbance Calculation Tool (DDCT) process found that the 5 percent threshold in suitable habitat in Core Areas would be exceeded. The Program evaluated this project, coupled with other disturbances within the AM5 permit area including Coal Bed Natural Gas (CBNG) and coal development, fire, and conifer encroachment.
2. Surface Occupancy	Within 0.6 mile of the perimeter of active greater sage-grouse leks there will be No Surface Occupancy (NSO) for new activities. NSO, as used in these recommendations, means no surface disturbance, including roads shall be placed in the NSO area.	Three active leks (Pasture, Ankney North and Ankney South) are located less than 0.6 mile from the AM5 project area.

Table 3.6-4 Deviations of the AM5 Haul Route Project from Montana EO 12-2015 Stipulations		
EO 12-2015 Reference & Description	**EO Language**	**Discussion**
	Attachment D – Core Area Stipulations (as amended)	
3. Seasonal Use	New activities will be prohibited from March 15 to July 15 outside of the NSO perimeter of an active lek.	The proposed project would occur during the seasonal use restriction period from March 15 to July 15.
4. Transportation	Locate main roads used to transport production and/or waste products >2 miles from the perimeter of active leks.	This project is within 2 miles of six active and two unconfirmed leks (Pasture, Alternate Pasture, Playa, Fenceline Playa, Fenceline Playa II, BI-012, Ankney North, and Ankney South) (**Table 3.6-2**).
6. Overhead power lines and communication towers	Power lines and communication towers should be sited to minimize negative impacts to greater sage-grouse or their habitats. When placement is demonstrated to be unavoidable: a) if economically feasible, powerlines within 4 miles of active greater sage-grouse leks should be buried; b) if not economically feasible then powerlines should be consolidated or co-located with above ground right-of-ways, such as roads or powerlines, at least 0.6 miles from the perimeter of active leks; and c) if co-location is not possible, the powerlines should be located as far as economically feasible and from active leks and outside the 0.6 mile NSO active lek buffer.	Three active leks are located less than 0.6 mile and seven active leks within 4 miles from the proposed AM5 route (Table 3.6-2). Route lights are proposed (locations to be determined) and it is anticipated these lights will be affixed to some type of vertical pole. The high voltage distribution line will be above ground.
7. Noise	New project noise levels, either individual or cumulative should not exceed 10 dBAs above baseline noise at the perimeter of an active lek from 6:00 p.m. until 8:00 a.m. during the breeding season (March 15 through July 15).	With active leks in close proximity to the AM5 project area, the 10 dBA above baseline standard may be exceeded during construction and reclamation (See Section 3.13).
8. Vegetation Removal	Vegetation removal will be limited to the minimum disturbance required by the project. All topsoil stripping and vegetation removal will occur between July 16 and March 14 in areas within 4.0 miles of active leks. Initial disturbance in suitable habitats between March 15 and July 15 may occur on a case-by-case basis.	Work schedule has not been finalized. SCM will minimize surface disturbance activities to the extent practicable during the primary breeding season (April 1 through July 31)

Table 3.6-4 Deviations of the AM5 Haul Route Project from Montana EO 12-2015 Stipulations

EO 12-2015 Reference & Description	EO Language	Discussion
Attachment D – Core Area Stipulations (as amended)		
Application of the Conservation Strategy to Land Uses and Activities		
Item 23.	New land use activities in Core Areas shall be authorized, approved, or conducted only when it can be demonstrated the project will not cause declines in greater sage-grouse populations.	This has not been demonstrated under the Proposed Action.
Attachment G: Recommendations for Range Management		
Item f.	Placement of new fences should consider their impact to greater sage-grouse and, to the extent practical, be placed at least 0.6 miles from active leks.	The Proposed Action would place the fencing within the AM5 corridor less than 0.6 mile from three active leks.

Measures Protective of Wildlife

Five distinct route alternatives were analyzed by SCM (**Figure 2.6-1**). The AM5 corridor route was selected by SCM to minimize potential impacts to wildlife and wildlife habitats during construction and operation compared to other possible locations. The Proposed Action Alternative includes the following measures to minimize potential impacts to wildlife resources (Sections 17.24.312 and 17.24.751 of the AM5 Application).

- Operations will be conducted in such a way that they will not result in the unlawful taking of any eagle, its nest, or any eggs. This applies to both bald eagles and golden eagles. The SCM will report to the DEQ and USFWS any bald or golden eagle roost site, seasonal concentration area, or breeding territory discovered in the AM5 area that has not already been reported to the DEQ. SCM will adhere to any monitoring and/or mitigation actions determined necessary by the USFWS or appropriate state agencies.
- The electric power distribution line will be designed in accordance with the most current recommendations from the Avian Power Line Interaction Committee (including "*Best Management Practices for Electric Utilities in Sage-Grouse Habitat*") and USFWS.
- SCM will minimize surface disturbance activities (e.g., soil salvage, road construction, grubbing, logging, exploratory drilling, etc.) to the extent practicable during the primary breeding season for most species in the region (i.e., April 1 through July 31). When activities must occur during the primary

breeding season, SCM will ensure that those areas are either made unsuitable for nesting (e.g., by mowing, blading, tree removal, etc.) prior to the breeding season or searched via a clearance survey for avian nests prior to initiating the disturbance. The timeline for clearance surveys may be extended to account for early or late-nesting species if appropriate habitats will be affected.

- If an active nest is located, SCM will delay activities within the appropriate buffer around the nest until it has reached its natural conclusion (i.e., young fledge or failure due to natural causes) whenever possible. If such delays are not possible, the USFWS and appropriate State agencies will be contacted for guidance.
- Appropriate best management practices will be used during road construction projects to minimize impacts to fish and wildlife resources (e.g., big game movements, aquatic habitats, etc.).
- Fences will be constructed per the most current guidelines issued by state or federal agencies in the region, except when variances are warranted and approved by the DEQ for safety reasons or to exclude wildlife from hazardous areas.
- SCM will fence, cover, or use other appropriate methods to exclude wildlife from ponds that contain hazardous concentrations of toxic forming materials. The most current recommendations for the region will be implemented as they become available.
- SCM will consult with appropriate state and federal fish and wildlife and land management agencies to ensure that reclamation will provide for the habitat needs of various wildlife species, in accordance with the approved post-mining land use.
- SCM will continue to provide nesting sites for resident and seasonally present raptors; construct scarps or steep-sloped areas designed to replace existing cliff habitat in the post-mining landscape to mitigate losses of potential raptor nesting sites within the affected area.
- Impacts to jurisdictional wetlands and streams will be mitigated consistent with USACE regulation, MPDES permits for construction and operation, and CWA Section 401 certification, and will be restored during final reclamation, if not permanently mitigated prior to final reclamation (see Section 3.5 Vegetation and Wetlands).
- Consolidate infrastructure such as roads, overhead power lines, etc. when feasible to minimize habitat fragmentation and avoid sensitive habitats, when possible.
- Conduct regular training sessions and/or communication with equipment operators, supervisors, and contractors to maintain awareness of the importance of wildlife in the environment at SCM, potential wildlife concerns, and the need

for all personnel to be committed to minimizing impacts to wildlife resources to the extent practicable, particularly during the breeding season and harsh winter conditions when species are most vulnerable.

These measures would reduce impacts from the Proposed Action.

3.6.3.3 Agency Modified Alternative

Table 2.4-1 and Section 2.4.1 describe DEQ's mitigations related to wildlife. As a result of the mitigations proposed, the AMA will have fewer impacts to wildlife and specifically to greater sage-grouse as compared to the Proposed Action alternative.

The AMA includes measures to minimize predation due to road infrastructure, and reduce the level of noise at critical breeding and rearing times for most birds and other wildlife. Fences would be designed to make them visible to low flying birds to reduce strike hazards. Fences would also employ current best management practices to facilitate wildlife passage over or under them while still functioning to control livestock. SCM would operationally (via fencing) limit access to approximately 7 acres along the east-central edge of the disturbance boundary to honor the recommended buffer distance (U.S. Fish and Wildlife Service 2017) around a golden eagle nest. That change in acreage reduces physical disturbance, and the haul road under the AMA would impact approximately 962.4 total acres rather than the total permitted acreage.

Overhead power lines and tall poles and structures provide perches for avian predators such as raptors and corvids (magpies and crows). By requiring the high voltage distribution line to be buried, opportunities for avian predation created by new perches would be eliminated compared to the Proposed Action. Burying the power line will also benefit birds by reducing opportunities for collisions. Before commencement of construction, the AMA includes a requirement to enhance habitat off-site for the required wetland mitigation, however the 404 permit is in process and mitigation acreage has not been quantified.

The EOs specify hours of operation and acceptable noise increase above ambient levels found to be less disruptive to greater sage-grouse during their breeding and brood rearing seasons. In the AMA, EO requirements and timing restrictions have been applied to SCM's road construction, hauling operations, equipment muffling, and reclamation activities to reduce noise. The reduction in project caused noise levels will benefit other wildlife as well, especially breeding birds.

The AMA requires, if allowable under MSHA requirements, SCM to reduce or minimize lighting needs for nighttime operation and to use downward directed lighting to minimize impact to dark sky conditions. If this is implemented, the reduction in artificial lighting will benefit wildlife by being less disruptive to natural rhythms such as predation, breeding, foraging, and migration (http://www.darksky.org/light-pollution/wildlife/).

Greater Sage-Grouse

Potential mitigation measures as identified in **Table 2.4-1** would reduce the intensity of impacts of the Proposed Action to greater sage-grouse and their habitats. It has been documented that 10,000 acre blocks of sagebrush are critical to successful reproduction and overwinter survival (Connelly et al. 2011).The AMA focuses on protection of breeding (leks) and surrounding nesting habitat. Loss of quality nesting and brood rearing habitat has been cited as an important factor in the decline of greater sage-grouse populations (Connelly and Braun 1997, Crawford et al. 2004, Atamian et al. 2010). Juvenile birds experience much higher mortality rates compared to adult birds (Crawford et al. 2004). High quality breeding, nesting, and brood-rearing habitat are critical to the reproductive success of greater sage-grouse.

It is understood that greater sage-grouse have little ability to adapt to different anthropogenic habitat disturbances by simply moving to other habitats (Connelly et al. 2011). The AMA comprises many actions which collectively may provide some benefit to this species, but the science related to their conservation and effective restoration strategies is still developing (Johnson et al. 2011). Because greater sage-grouse are a landscape species, in order to accomplish improved habitat conditions it is necessary to apply mitigations to lands outside of the 970 disturbed acres within the AM5 corridor. Previous anthropogenic disturbances to greater sage-grouse habitat and current projects are already impacting and would continue to impact this habitat. Any benefits of on-site mitigation would likely be negated by the project and the intensive nature and duration of the activity now being considered.

The Sage Grouse Program strongly recommended off-site mitigation to offset the direct and secondary impacts of the project on greater sage-grouse. The Sage Grouse Program, in consultation with DEQ and SCM developed the mitigation measures to be implemented as specified by **Appendix B**. These mitigation measures would be in addition to the items described under the Proposed Action as “measures protective of wildlife”. SCM’s initial efforts to avoid impacts to greater sage-grouse and their habitats occurred during the planning phase of the project. These included meeting with DEQ to discuss options to achieve this goal and through adoption of recommendations outlined in Montana EO 12-2015 (State of Montana 2015a), to the extent practicable for the project.

When analyzing the effect of proposed mitigations on greater sage-grouse, the following were considered:

- Does the mitigation encompass a large or keystone habitat areas;

- Is the nature of the mitigation such that would result in positive benefits to greater sage-grouse or their habitats;
- Is the duration of the mitigation sufficient to provide tangible benefits (for example: establishing a livestock grazing program designed to benefit greater sage-grouse habitat, but only implementing the management for ten years may not provide tangible benefits);
- Are there other factors, including anthropogenic disturbances present on site, that would minimize the effectiveness of a mitigation measure;
- Is the scale of the mitigation likely to be effective (for example: removal of one mile of overhead high voltage distribution line in an area that has an average of three miles of powerlines/square mile may have limited value);
- Is there long-term company, agency, or other support for such actions;
- Can the action be long-term in nature; and
- What is the probability of success given current methods and technology?

Where avoidance was or is not possible, SCM identified options to minimize potential impacts to greater sage-grouse and their habitats and deviations from EO 12-2015 (State of Montana 2015a. Such efforts include:

- design the road alignment to minimize surface disturbance within lek buffers and provide the greatest possible visual and audio barriers between the disturbance corridor and wildlife-related features, including strategic placement of cut and fill material to create or enhance such barriers;

- consolidate infrastructure (e.g., co-located the road and overhead power line);

- space new overhead transmission line poles along the haul road route to minimize placement within 0.6-mile NSO lek buffers;

- select single power pole construction (vs. H-frame) and install deterrents on power poles to reduce perching options for avian predators, and follow other BMPs recommended by APLIC (2015, 2012, 2006) to minimize potential impacts to sage-grouse and other avian species;

- limit the number of other light poles and potential perches for avian predators;

- turn idling equipment off during operation of the haul road to the extent practicable (i.e., when weather conditions allow based on equipment needs);

- limit blasting needed in rocky areas etc., during the construction phase to daytime hours (8:00 a.m. to 6:00 p.m.);

- conduct continuous noise level monitoring at active sage-grouse lek perimeters from March 1 through July 15 during road construction and reclamation;
- discontinue construction between 6:00 p.m. and 8:00 a.m. if individual or cumulative noise levels exceed 10 dBA above baseline noise at that location;
- implement other appropriate BMPs during all phases to minimize erosion, employ weed control, and control trash and other predator attractants, etc.;
- build new fencing to current standards for sage-grouse and big game, place fencing as close to the road berm as possible and/or install markers on fence wires to enhance visibility per current guidelines from the MFWP (2012) and/or USDA (2012) Natural Resources Conservation Service;
- enhance the likelihood of wildlife using new culverts as crossings by consulting the latest research such as the Wildlife Crossing Structure Handbook – Design and Evaluation in North America (U.S. Department of Transportation Federal Highway Administration, Publication No. FHWA-CFL/TD-11-003);
  - construct/remove road segments near or at stream crossings during low flow periods;
  - keep construction equipment out of wetland/riparian/saturated areas, or time construction to occur when ground is frozen to minimize soil compaction; and
  - include erosion protection at culvert crossings to minimize impacts to stream flow and channels; and
- modify grazing lease to support cheatgrass control and manage livestock presence in greater sage-grouse brood habitat in riparian areas to extent practicable using fencing and rotational practices.

Both sides of the AM5 corridor would be fenced in order to keep livestock from accessing the road. Fence collisions by greater sage-grouse have been well documented. Most collisions are a result of greater sage-grouse flying in low light conditions, often as they move toward leks. Not all fences are considered a hazard. USDA-NRCS has developed a computer program which identifies those fence sections which are of greater probability for strikes by greater sage-grouse (https://map.sagegrouseinitiative.com/). Potential for fence strikes is at least in part a function of the distance between the fence and the lek(s), and terrain.

As noted in the discussion of the Proposed Action Alternative, greater sage-grouse avoid elevated structures. If the proposed power distribution line is buried, there would be fewer perches along the roadway for opportunistic predators. Installing antiperching devices, even for single pole structures such as lights, will reduce the potential for predation from raptors.

Mitigation described as "considering decommissioning all roads and pipeline routes where appropriate" to enhance greater sage-grouse habitat and remove surfacing materials may be beneficial. Infrastructure associated with coal bed natural gas development and in some instances coal development resulted in the fragmentation of significant portions of the landscape surrounding the AM5 project area. Most of the buried pipeline footprint was reclaimed, utilizing grasses and forbs. If landscape level restoration of these disturbed sites were to occur, greater benefits would be expected.

Minimizing predation by controlling predator attractants like trash may have a marginal mitigating effect on greater sage-grouse populations. However, prevention of further loss of greater sage-grouse habitat will yield greater benefits (Leu and Hanser 2011).

3.7 Aquatics

The methods and results described below are summarized or excerpted from the SCM Baseline Aquatic Survey and Assessment completed by Stagliano (2015). The information provided is focused on data most relevant to assessing and addressing the likely impacts of the alternatives being considered. More detailed information is found in the original report. In addition to the field surveys described below, the MNHP, the USFWS, MFWP's Montana Fisheries Information System (MFISH), and the DEQ Ecological Data Application System (EDAS) databases were queried for information on special status species, prior surveys, and results from the general area.

Table 3.7-1. Applicable Rules and Regulations for Aquatic Resources

Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 17.24 Subchapter	**Summary of Requirement**
301	Definitions
304	Listings and maps of all streams and water bodies, information on discharge, water quality, species present, and habitat quality
305	Maps of all resources identified in 304 as well as plans for water management
313	Detailed drainage designs for all channels with critical hydrologic, ecologic, or land use functions
314	Addresses hydrologic balance maintenance and requirements
317	Addresses requirements for temporary and permanent diversions including culverts
321	Transportation crossings of waterbodies

Table 3.7-1. Applicable Rules and Regulations for Aquatic Resources

325	Addresses reclamation operations in, adjacent to or under a valley holding a stream in the arid or semi-arid regions. Alluvial valley floors.
Applicable Rules and Regulations under the Montana Strip and Underground Mine Reclamation Act	
MCA 82-4-2 Subpart	**Summary of Requirement**
203	Definitions
222	Addresses the hydrologic balance and monitoring
231	Contents of the reclamation plan including water treatment, discharge, and preservation of stream channels

3.7.1 Analysis Methods

CPE collected two years of baseline fish, macroinvertebrate, and amphibian data from 2014 through 2015 on the condition of the aquatic ecosystems potentially affected by future development projects associated with the SCM (Stagliano 2015). Little or no prior data exist for the area within the SCM permit area or the AM5 area. Multi-year assessments provide better characterizations of the innately variable prairie stream aquatic community which tends to vary in response to seasonal and year-to-year water availability. The years sampled, 2014 and 2015, were within the middle range of water year patterns for the area and were thus likely to exhibit fish, macroinvertebrate, and amphibian presence representative for the area in an average water year. There are no sampling data for the Squirrel Creek assessment unit in the current DEQ Water Quality Attainment Record (CWAIC 2016b). Youngs, Little Youngs, and Dry Creeks have no assessment records and are not listed in the materials for the Upper Tongue River assessment unit (CWAIC 2016a).

3.7.1.1 Site Selection and Habitat Assessment

Sites were chosen to represent the range of prairie stream types found in the vicinity of the SCM: ephemeral, intermittent, and perennial prairie streams. Squirrel Creek and Youngs Creek were the two mainstem perennial reaches surveyed. Little Youngs Creek, an intermittent tributary to Youngs Creek, and Dry Creek, an ephemeral tributary to Squirrel Creek, were also surveyed. All surveys occurred in mid-August 2014 and mid-July 2015 (Stagliano 2015). Two, 980-foot reaches were sampled on each stream, a reach upstream of the proposed alignment intersection, and a reach downstream. However, no sites were sampled for fish or macroinvertebrates in Dry Creek because there was no surface water present in either year (Stagliano 2015). Stream gradients were estimated by the difference in the top and bottom reach elevations (collected using a global positioning system (GPS) device at each location) divided by the reach length.

There are no USGS gages on any stream in the survey area, and no streamflow measurements were taken during field surveys. Physical habitat characteristics of each stream were measured using the Bureau of Land Management (BLM) and Environmental Monitoring and Assessment (EMAP) protocols (BLM 2008; Lazorchak et al. 1998). The Livestock Use Index (CPI) was assessed by walking a randomly chosen 245-foot transect along both sides of the stream channel in the riparian area within the assessment area and counting all the old and new cow pies (higher CPI equals high cow usage). The goal of the habitat assessments was to characterize local reach geomorphology, riparian and in-stream habitat, and characteristics that influence aquatic community integrity. Sites ranking higher using these protocols were determined to have higher quality habitat at the local reach scale.

3.7.1.2 Macroinvertebrate Sampling

Macroinvertebrate samples were collected within the DEQ recommended sampling timeframe of June 1 through September 15 (DEQ 2012). Macroinvertebrate communities were sampled semi-quantitatively from ten, evenly-spaced transects within each 980-foot assessment reach using the EMAP Reach-Wide Protocol (Lazorchak et al. 1998). Sampling started at the farthest downstream transect and proceeded upstream, alternating sampling with a 500-micron D-frame net to the left, right, or center of the stream channel to obtain a random sampling of all habitats. The 10 samples from each reach were combined and organisms and organic material were separated (elutriated) from inorganic portions (sediments). The organic portion retrieved from the sieve was transferred to one or two 1-quart Nalgene bottles, labeled, and preserved in 95 percent ethanol and brought to the MNHP lab in Helena for processing (sorting, identification, and data analysis) following protocols outlined by DEQ (2012).

Macroinvertebrates were identified to the lowest taxonomic level (DEQ 2012), counted, imported into EDAS (Jessup 2006), and biological metrics were calculated from the data using the DEQ's newest Multimetric Index (MMI) protocols (Jessup et al. 2005; Feldman 2006). Metric results were scored using the DEQ bioassessment criteria and each sample categorized as unimpaired or impaired according to threshold values established from regional reference conditions. It should be noted that DEQ no longer uses macroinvertebrate sampling data from prairie streams as an independent indicator of water quality impairment (DEQ Water Quality Assessment Method, November 28, 2011, at 12 and Table A-2). Over several years of data analysis, DEQ was unable to consistently determine if lower MMI scores indicated human-caused stream impairments in these prairie stream environments. After extensive efforts to make this comparison in eastern prairie streams, the WQB has not been able to develop or use existing macroinvertebrate tools to consistently identify the difference between known impaired and reference condition streams. The decision to not include macroinvertebrate data for prairie streams was informed by DEQ's extensive experience and inability to consistently determine when a poor biological metric was the result of a man-made source or simply a naturally stressed environment. Therefore, trends in site-specific data would need to be established to assess changes to in-stream conditions reflected by the macroinvertebrate communities.

3.7.1.3 Fish Community Sampling

Each 980-foot reach was sampled using a seine following protocols outlined in Bramblett et al. 2005). Block nets were placed at each end of the sampling reach and each seine haul covered approximately 100 foot sections within the reach. At the end of each haul, fish were collected into a live car or bucket until processing was completed. Fish were identified to species, at least 10 percent of each species captured were measured, and all fish were examined for any external abnormalities indicative of disease or environmental stressors and then released back to the sample reach. Young-of-the-year fish less than approximately ¾ inch total length were noted on the field sheet and released, but were not included in the totals.

All stream reaches were visually surveyed for amphibians and reptiles during each sampling session, as well as audibly for calling amphibians.

Fish communities were analyzed using the Integrated Biotic Indices (IBI) designed for wadeable prairie streams (Bramblett et al. 2005). The IBI along with an observed/expected model for fish community diversity was used to characterize the level of ecological impairment. In general, more diverse aquatic communities are indicative of lower levels of disturbance or environmental stressors. Scores are calculated by dividing the observed number of native fish species at a site by the number expected for that reference stream class, and then converted to a percentage and ranked. Sites scoring higher than 75 percent are generally considered indicative of high integrity (unimpaired) (Stagliano 2015). The designation of "impaired" in the IBI rankings is not equivalent to a water quality determination. Fish IBI scores that fall into the impaired levels indicate that the fishery present is different from and less diverse than a reference condition fishery. Although a fishery may change in response to degraded water quality, the IBI score is an indicator, not a direct measure of water quality. Similar to the WQB finding regarding the use of macroinvertebrates as water quality indicators, it is difficult to discern when changes in fish communities as measured in an IBI in prairie environments are the result of human causes or natural perturbations.

3.7.2 Affected Environment

Many small prairie streams that constitute the Great Plains Intermittent Stream ecological system (Stagliano 2015) are highly variable, and may have limited downstream connectivity early in the season for potential fish spawning and nursery areas (Smith and Hubert 1989, Bramblett 2005) or have no fish colonization at all in dry years. By summer, this stream system type often becomes a string of isolated pools that are important breeding and rearing areas for amphibians (Stagliano 2011), but may no longer support fish. Some prairie stream types such as the Great Plains Intermittent stream type are naturally fishless as much as 80 percent of the time due to flow variability and long-term hydrograph trends. Therefore, a lack of fish may not point to impairment if other attributes resemble reference conditions.

3.7.2.1 Habitat Results

Of the eight sampling reaches evaluated in the study area, three were considered in Proper Functioning Condition (PFC) with a stable trend, four were Functional at Risk (FAR), and one was a non-functioning reach (NF) (**Table 3.7-1**). Rankings of FAR or NF were due to habitat alteration by cattle (Squirrel Creek upstream (U/S), Little Youngs Creek U/S [Figure 3], and Youngs Creek U/S) or stream manipulation (Youngs Creek U/S and downstream (D/S)). Highest site integrity scores using both the BLM Habitat and PFC Assessment methods were recorded at the Squirrel Creek D/S and Little Youngs Creek D/S. As noted earlier, there are no sampling data for the Squirrel Creek assessment unit in the current DEQ Water Quality Attainment Record (CWAIC 2016b). Youngs, Little Youngs, and Dry Creeks have no assessment records and are not listed in the materials for the Upper Tongue River assessment unit (CWAIC 2016a).

3.7.2.2 Macroinvertebrate Results

Overall, 67 unique macroinvertebrate taxa were reported from the six macroinvertebrate samples collected in 2015. Macroinvertebrate densities at all sites were significantly lower in 2015 than in 2014 (**Table 3.7-2**). No Montana species of concern were detected at any of the sites (Stagliano 2015). Squirrel Creek's upstream site had the highest taxa richness (31 species) recorded and the most mayfly (E), stonefly (P) and caddisfly (T) taxa, (8 EPT taxa) at a site (**Table 3.7-2**). Average macroinvertebrate richness was 22.0 species per site; this was significantly lower than the average of 31.7 taxa per site in 2014 (t-Test p=0.01). EPT taxa averaged 4.8 taxa per site in 2015; this is also lower than the average of 5.7 recorded in 2014, but not significantly. Other invertebrate metrics were similar between the two baseline years. In particular, the burrowing taxa averaged 39 percent in 2015 and 42 percent in 2014. These results represent a greater than average proportion of burrowing taxa than what is typically expected for streams of this nature, and indicates excess sediment in the surveyed stream reaches.

Table 3.7-2. Information on physical stream characteristics for the sites sampled within the SCM expanded monitoring area. Survey data are averaged from the upstream and downstream sites for each creek by year.

	Squirrel Creek		**Youngs Creek**		**Little Youngs**		**Dry Creek**[1]	
Watershed Area (acres)	373.1		313.8		123.6			
Watershed Area (mi²)	58.3		49		19.3			
Stream Gradient (%)	1.5		0.8		2.2		0.8	
Stream Type	Perennial Prairie (C005)		Perennial Prairie (C005)		Small Fishless Prairie Stream/ Great Plains Intermittent (S005/D005)		Great Plains Ephemeral (E005)	
Survey Data	**2014 Aug**	**2015 July**	**2014 Aug**	**2015 July**	**2014 Aug**	**2015 July**	**2014 Aug**	**2015 July**
Water Temp °F	73.94	76.64	60.08	64.76	64.4	65.84	NA	NA
Conductivity (µs/cm)	1,298	1,087	620	648.5	486.5	506.5	NA	NA
TDS (ppm)	650	543	310	324.5	242	252.5	NA	NA
pH	8.6	8.1	8.4	8.2	8.5	8.3	NA	NA
PFC BLM HBI[2]	FAR 14 -17	FAR 16 -17	PFC 19 / FAR 17	PFC 19/ FAR 17	FAR 16/ NF 8	FAR 17/ NF 11	PFC 22-23	PFC 22-23
Avg wetted width (ft)	4.9	6.9	3.4	3.8	3.6	5.1	3.4*	3.4*
Avg Left CHD (in)	4.5	6.3	9.8	10.6	2.4	2.6	NA	NA
Avg Center CHD (in)	5.7	9.1	11.6	14.4	2.8	3.3	8.9*	8.9*
Avg Right CHD (in)	4.9	5.7	10.6	9.3	1.8	2.0	NA	NA

Table 3.7-2. Information on physical stream characteristics for the sites sampled within the SCM expanded monitoring area. Survey data are averaged from the upstream and downstream sites for each creek by year.

	Squirrel Creek		Youngs Creek		Little Youngs		Dry Creek[1]	
Percent Fines in Reach	89.0	68.0	96.5	82.5	69.0	40.5	10.0	10.0
Percent Gravel Reach	7.0	16.5	2.0	14.5	28.0	35.5	12.5	12.5
Percent Pebbles/Cobble Reach	4.0	15.5	1.5	3.0	3.0	25.5	77.5	77.5
Livestock Use (CPI)	16.0	12.0	16.5	11.0	6.5	7.0	0.0	0.0
Avg. Riparian Shade (percent)	25.0	29.0	50.0	54.0	55.0	60.0	5.0	5.0

Full data are available in Stagliano 2015.
[1]No water was present in either sample session in Dry Creek
[2]Proper Functioning Condition, Bureau of Land Management Hilsenhoff Biotic Index (PFC BLM HBI)
PFC= Proper functioning condition; FAR= Functioning at risk; NF=Non-functioning
* Estimated from non-vegetated edge of dry creek bed.

The macroinvertebrate Multi-Metric Index (MMI) score (**Table 3.7-3)** is based upon a series of metrics that measure attributes of benthic macroinvertebrate communities that are sensitive to condition changes in the stream (i.e., in the form of pollution or pollutants). The Hilsenhoff Biotic Index (HBI) is a measure of tolerance of a macroinvertebrate community to organic enrichment. Tolerance values are based on a scale of 0 to 10, where taxa ranked as "0" are most sensitive and those ranked as "10" are most tolerant to pollutants (Hilsenhoff 1987).

Because the species present in a sample year represent those that bred successfully the previous year, the index score represents the condition of the macroinvertebrate community during the year prior to the time the sample was collected. If the index score is below the impairment threshold, the individual metrics can be used to provide insight as to why the communities are different from the reference condition (Barbour et al. 1999, Jessup et al. 2005). The impairment threshold set by the DEQ is 37 for the Plains Stream Index; thus, any scores above this threshold are considered unimpaired. All sites except for those at Youngs Creek were rated as unimpaired. Generally, scores were consistent between years for the same site and within a stream. Stagliano (2015) reviewed previous monitoring completed by DEQ and found that the Youngs Creek sites had ranked as impaired in 2005 and 2006, but had shown improvement in 2014 to above the impairment threshold. Similar to the fish IBI, the MMI designation of "impaired" indicates changes in the macroinvertebrate community, but is not a direct measure of water quality parameters.

Table 3.7-3. Macroinvertebrate Community Sampling Results from July 2015 from Sites along the AM5 Alignment.

Site Name	Density (#/m2)	Plains MMI Index	Total Taxa	EPT Taxa	% EPT	HBI	% Non-Insect	% Burrower Taxa
Squirrel Creek D/S	492.0	46.7	26.0	3.0	48.1	5.8	17.8	45.0
Squirrel Creek U/S	692.0	62.7	31.0	8.0	24.6	6.0	26.5	42.1
Averages	**592.0**	**54.7**	**29.0**	**6.0**	**36.4**	**5.9**	**22.2**	**43.5**
Youngs Creek D/S	**218.0**	**28.8**	**15.0**	**3.0**	**34.2**	**4.7**	**39.0**	**46.2**
Youngs Creek U/S	154.0	37.0	15.0	4.0	19.0	6.0	55.2	38.5
Averages	**186.0**	**32.9**	**15.0**	**4.0**	**26.6**	**5.4**	**47.1**	**42.3**
Little Youngs D/S	862.0	47.9	24.0	5.0	21.9	5.8	20.1	28.6

Table 3.7-3. Macroinvertebrate Community Sampling Results from July 2015 from Sites along the AM5 Alignment.								
Site Name	**Density (#/m2)**	**Plains MMI Index**	**Total Taxa**	**EPT Taxa**	**% EPT**	**HBI**	**% Non-Insect**	**% Burrower Taxa**
Little Youngs U/S	418.0	55.2	23.0	6.0	38.2	5.7	35.7	35.0
Averages	**640.0**	**51.5**	**24.0**	**6.0**	**30.1**	**5.8**	**27.9**	**31.8**
Mean Values Across All Sites	**472.6**	**46.4**	**22.3**	**4.8**	**31.0**	**5.7**	**32.4**	**39.2**

Source: Stagliano 2015
MMI: Multi-metric Index
EPT: Ephemeroptera, Plecoptera, and Trichoptera
HBI-index of pollution sensitivity ranges from 0 (sensitive) to 10 (highly tolerant)

3.7.2.3 Fish Community Results

Overall, six fish species (five native, one introduced) were identified from 2,131 individuals collected during the 2015 surveys. Fish were captured at all sites containing water, except the Little Youngs Creek downstream reach **(Table 3.7-4).** No Montana species of concern were documented during the surveys. One introduced fish species, the green sunfish (*Lepomis cyanellus*), was collected at one site on Youngs Creek.

Using Montana's Prairie Fish IBI, all fish sites ranked non-impaired in both years; the calculated scores in the 90-100 range are some of the best IBI scores attained in this region (Stagliano 2015). Stagliano (2015) found that fish IBI scores from Squirrel Creek have steadily increased through its reported years of sampling (2005-2015), while similar data have shown non-trending fluctuations in Youngs Creek IBI scores (2003-2015), likely related to several drought years during that period (**Figure 3.7-1**).

Table 3.7-4. Fish Community Sampling Results from the Eight Sample Reaches Surveyed in the AM5 Area in July 2015.

	Squirrel Creek		Youngs Creek		Little Youngs Creek		Dry Creek			
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	Total	Count Sites
Creek Chub *Semotilus atromaculatus*	1,036	520	18	3	0	0	ns	ns	1,577	4
Fathead Minnow *Pimephales promelas*	23	16	0	0	0	0	ns	ns	39	2
Lake Chub *Couesius plumbeus*	0	0	30	12	0	0	ns	ns	42	2
Longnose Dace *Rhinichthys cataractae*	86	143	63	90	5	0	ns	ns	387	5
Green Sunfish[2] *Lepomis cyanellus*	0	0	0	3	0	0	ns	ns	3	1
White Sucker *Catostomus commersonii*	66	8	9	0	0	0	ns	ns	83	3
Total number species	4	4	4	4	1	0	0	0	6	
Native Species	4	4	4	3	1	0	0	0	5	
Total Individuals	1,211	686	120	108	5	0	0	0	2,131	
IBI	90.1	91	95.9	96.4	100.13	60.8	56.1	56.1		
Observed/Expected (%)	72.7	72.7	106.7	80	66.7	0	0	0		

U/S = Upstream, D/S = Downstream, ns = not seined (dry during site visit)

IBI: Index of Biotic Integrity score (percentile)

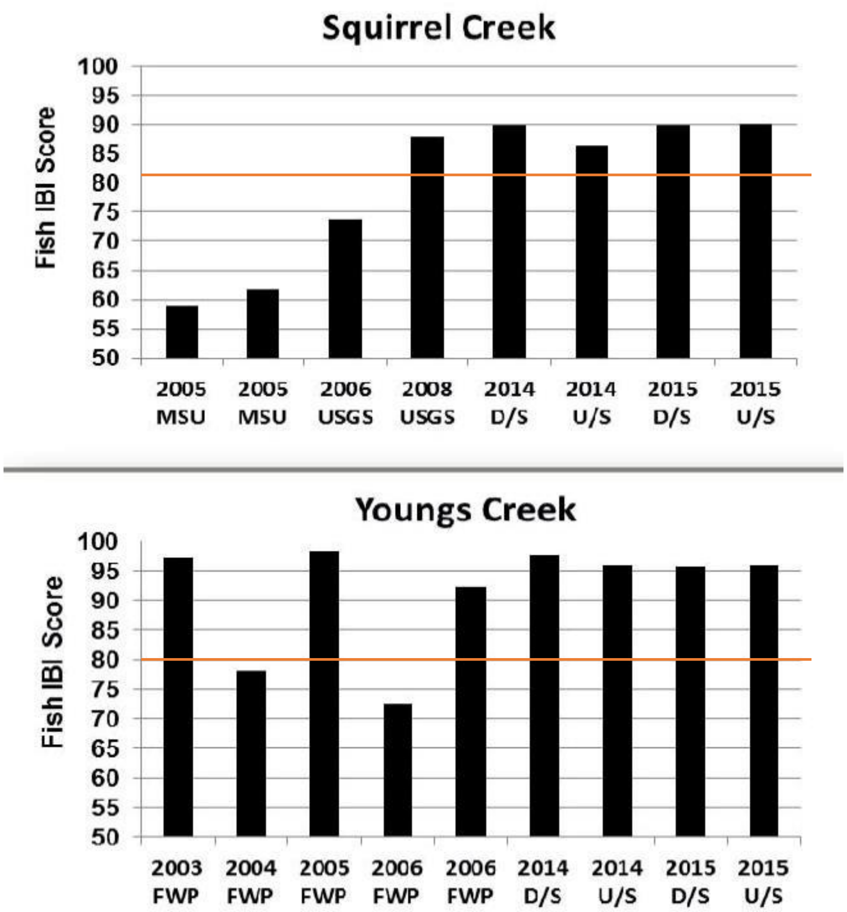


Figure 3.7-1. Fish IBI scores reported by other agencies and during the 2014 and 2015 sampling at Squirrel Creek and Youngs Creek in the Spring Creek Mine expanded monitoring area (Stagliano 2015). The red line indicates the threshold value (80) for impairment under the IBI ranking criteria.

3.7.2.4 Special Status Species Results

The MNHP (2017) database query indicated that the snapping turtle (*Chelydra serpentina*) was the only aquatic species of concern documented to occur within the AM5 permit area, with presence identified in reaches of both Squirrel and Youngs creeks. Although methods were not focused on sampling turtles, the aquatic surveys did not find evidence of this species or any other aquatic invertebrate or vertebrate Montana species of concern during either year (Stagliano 2015).

Likewise, no federally listed T&E aquatic species were observed during the 2014 and 2015 surveys, nor are there any aquatic species listed by the USFWS likely to occur in the habitats present in the AM5 area or Big Horn County (USFWS 2017).

3.7.3 Environmental Consequences

3.7.3.1 No Action Alternative

Under the No Action Alternative, the AM5 permit amendment would not be approved and ongoing land uses would continue. Impacts to aquatic life described under the action alternatives would not occur. Impacts from cattle, if grazing is allowed to continue as currently managed, would be expected to persist.

3.7.3.2 Proposed Action Alternative

Primary impacts due to the Proposed Action would stem from the excavation, diversion, and channelization of substantial lengths of natural channel into traditional hard-bottomed culverts at the Dry, Squirrel, Youngs, and Little Youngs Creeks crossings. The aquatic habitat in the reaches that would be contained in the culverts would be lost for the duration of the project until reclamation is completed. The extensive lengths of the planned culverts exceed much of what has been studied in the ecological literature in terms of impacts to aquatic habitat and aquatic organism passage; therefore, much of the impacts analysis extrapolates on known effects from studying road culverts, which generally range from 20 to 150 feet in length. For comparison, the required width for a four-lane interstate highway is approximately 120 to 150 feet including a 36-foot wide median separating the double lanes of opposing traffic with 8 to 10 foot shoulders (FHWA 2007). The running surface of the haul road is similar in width, but the height necessary to retain acceptable grades and large amounts of fill create substantially wider road bases that the culverts must span (**Figure 2.3-2).**

Impacts During Construction

During construction, the stream channels would be excavated and large amounts of fill would be placed in the valley bottoms. BMPs would reduce impacts due to sediment input, and phasing construction to concentrate earth moving activities during the dry season would further reduce potential impacts to aquatic species.

When the streambed surface of an intermittent stream is dry, channel substrate and sediments often retain moisture and support some burrowing species as well as earlier life stages of metamorphosing species. Any macroinvertebrate eggs and larvae in the stream channel sediments would be destroyed during excavation. Riparian vegetation would also be removed. The lengths of channel that would be affected during construction would be longer than the final road base widths to account for equipment movement and staging (**Table 3.7-5**). Areas disturbed during construction, but outside of the final road base footprint, would be reclaimed and replanted prior to operation which would reduce the potential for excess erosion or sediment entering the streams.

The low gradient streams typical of this area tend to have greater sinuosity (are more meandering). Placing the streams in a culvert would require straightening the channels which would decrease overall stream length and consequently increase the gradients and flow velocities for those reaches. The least impactful culverts are those that minimize disturbances to the natural stream alignment, slope, and flow. Aligning the culvert with the existing inlet and outlet (following the native stream channel) would reduce the potential for erosion around the inlet; however, because these culverts are substantially longer (ranging from 320 to 600 feet) than a standard road crossing, it would be impracticable to have the culvert follow the natural channels' curving alignments. SCM anticipates that it would take about one to two years to construct the entire AM5 corridor, but the duration of on-site disturbance at each crossing would be much shorter if each crossing is constructed sequentially. The intensity of the primary impacts during construction would be high, and the entire streambed and riparian edge at each site would be removed and replaced with engineered materials.

Table 3.7-5 Stream Crossing Culvert Dimensions and Pre-Construction Stream Measurements

Site Name (Culvert ID)	Total Road Base Width (feet)	Culvert Length (feet)	Culvert Diameter (feet)	Mean Wetted Channel Width[1] (feet)	Culvert Slope (%)	Estimated Water Depth Mean Annual High Water [2] (feet)
Squirrel Creek (117)	616	470	15	5.9	3.18	1.55
Dry Creek (121, 122)	668	608	10	3.4	2.08	0.96
Youngs Creek (129)	451	345	27[3], 27[3]	3.6	2.43	0.83,
Little Youngs Creek (136)	386	324	22[3]	4.4	2.59	0.46
Total	2,121	1,747				

Sources: Ackerman 2017d, SCM 2015 (Appendix K, Exhibit 1); and YCM 2016 (Exhibits 1-2, 2-2, 3-2, and 4-2).

1 As measured in Stagliano 2015

2 Estimated water depth in the culvert based on mean annual high water event and proposed culvert diameters.

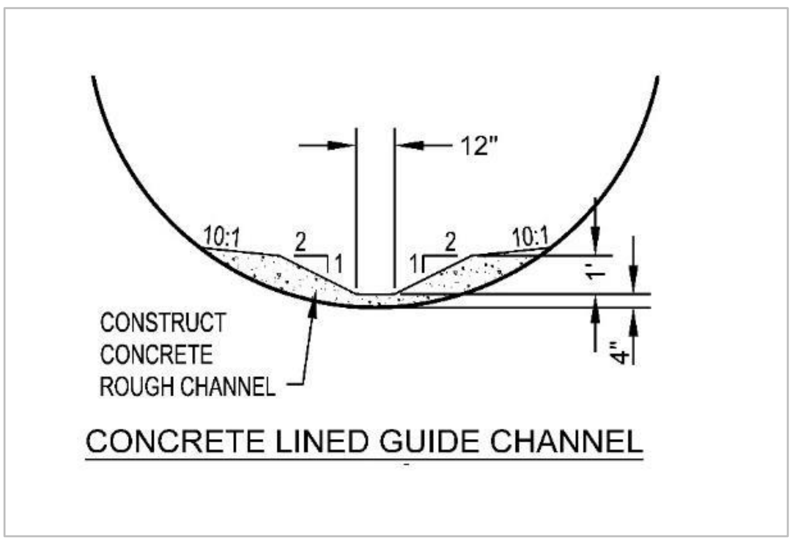
3 Elliptical culvert, measured at widest point.

Impacts During Operation

Once the roadway is built, the culverts would block sunlight necessary for photosynthesis for resident algae and phytoplankton which would reduce primary production in the culvert sections to near zero. At a minimum, fish and macroinvertebrates would continue to pass downstream through these reaches, but it is doubtful that any would reside inside the culverted reaches beyond the areas near either end. The ability of fish and macroinvertebrates to enter and pass upstream through the relatively smooth, engineered channels would be limited by water velocity inside the culvert and any vertical gap between the outlet of the culvert and the downstream channel bed (perching). The water would cool as it flows through the shaded culvert which may reduce stream temperatures near the outlets during hot days. The shading from the culvert and fill may also reduce evaporation slightly.

As noted above, the low-gradient streams typical of the AM5 area meander across the floodplain and dissipate energy. Channelizing the curves into straight culverts would increase the overall speed of the water flow and the resultant erosive force when the water exits the culvert. In addition, the gradients proposed for the culverts are steeper than the natural channel slopes (**Table 3.7-4**). The fish that live in the streams are small minnow and sucker species (**Table 3.7-3**). These fish would normally move up and downstream during the seasons when water is present. Since these fish are not adapted to jumping vertical barriers, the culverts would potentially restrict fish movement if the downstream ends are placed above the natural grade or if the inlet or outlet erodes. In addition, the increase in water velocity inside the culverts may make passage difficult.

The roughened concrete lining and "low flow channel "proposed for culverts at Squirrel, Youngs, and Little Youngs Creeks would concentrate water in the center of the culvert bottoms. The low flow channel design creates a 3-foot wide waterway that tapers to a 1-foot depth in the center of the culvert with varying width "banks" extending to the edges of the culvert width (**Figure 3.7-2**). This would serve to increase the depth of water when flows are low, but would also create a straight, fast run of current at higher water levels that may present an obstacle for upstream fish movement. The length of the culverts increases the passage difficulty for fish if no velocity controls exist within the culvert. The smaller prairie fish species present are not adapted to swimming in long bursts with no rest spots.



Source: YCM 2016, ExhibitA-1.2

Figure 3.7-2 Proposed Guide Channel Schematic showing Low Flow Channel.

Aquatic stages of macroinvertebrates generally do not migrate upstream for long distances for dispersal since their flying or adult stage can travel longer distances with less limitation. Therefore, it is unlikely that the culverts would negatively affect macroinvertebrate dispersal. However, the velocity and uniformity of the water in the culvert may create a "one-way" path downstream for any macroinvertebrates that wash into it, especially if a drop develops at the outlet.

The water exiting the culverts may erode downstream sediments, particularly if the culvert bottom is above the natural grade creating a drop (Lang 2004). Streams often develop "head cuts" for short distances upstream of channelized sections as the increase in stream velocity in the straightened section creates a flow vacuum that affects the flow rate above the culvert (FHWA 2010). These actions are exacerbated by inherently unstable channels. The habitat data suggest that impacts from cattle grazing may be causing bank erosion at the upstream Squirrel Creek and Little Youngs Creek sites which could contribute to destabilization at those sites (**Table 3.7-1**).

SCM has proposed installing rock gabions downstream of the culvert outlets to reduce water velocity (grade control), but this may serve to create a sediment dumping spot as the higher energy water drops suspended sediments as it slows abruptly. This may reduce the sediment supply for the reaches immediately downstream as well. Although these streams are intermittent, spring flows are capable of transporting sediments and debris. The straight run and consistent flow would likely carry sediment through the culvert rather than dropping it irregularly the way a native channel would. Monitoring the outlets and grade control structures for sediment deposition and debris jams would be important for preventing excess deposition or erosion that would make the grade control less effective.

The culverts are sized to accommodate large flood events (**Table 2.3.2**). The Q100 is the flow estimated for the 100-year flood, or a flood event that has a one percent probability of occurring in any given year. The culverts are sized so that flows would fill them approximately 70 to 80 percent of their vertical height during the Q100. This may cause a backwater to develop upstream of the culvert inflow and lead to erosion of the roadbed off to the sides of the inlets during high flow events. The culverts on Youngs and Little Youngs Creeks are elliptical and therefore have a greater total volume for their vertical diameter than a round culvert would, but the second culvert at the Youngs Creek crossing is designed to be an overflow channel and, per current road design practice, would be placed approximately 1.5 feet higher than the culvert located in the main stream channel (CPE 2016, Schall et al. 2012). It would be important to monitor the culverts during large flood events to ensure that debris does not block the culvert inlets and force water out of the channel where it would erode the road base.

Other potential impacts to aquatic resources could stem from contamination of waterways from erosion, fuel, chemical, or coal material spills. The most likely cause of contamination would occur during mobile fuel transfer. Fueling operations using mobile trucks may spill small amounts of fuel or oil during fueling or on-site maintenance. In addition, there is the potential for a fuel truck to be involved in an accident on the roadway and spill its contents. The AM5 plans call for large berms on either side of the roadway which should limit the distance that fuel, chemicals, or any coal spilled would be able to travel. The stormwater protection plan (See Section 2.3.7 and 2.3.8) also manages how runoff including spilled material flows off the roadway and provides for containment in the settling ponds where materials can be intercepted before reaching a stream or drainage.

Impacts During Reclamation

At the end of the project, the roadway would be reclaimed and the culverts removed. Similar to the construction phase, work for reclamation should be completed when flows are low or during periods of no flow (winter or late summer). The project is estimated to be in place for 18 years, a long enough period for riparian vegetation to become established at the inlet and outlet area of each culvert. Removing the culverts and the large amounts of fill at each stream crossing will disturb deposited sediments, riparian vegetation, and channel substrates. Reconstructing the channels to return stream gradients to pre-project conditions will require careful planning and re-meandering of the channels. ARM 17.24.634 requires SCM to design the reclaimed channels to restore the channel to its natural characteristic pattern and to restore a diversity of aquatic habitats. In their amendment application (17.24.634(h)), SCM states that, "Squirrel Creek, Youngs Creek, and Little Youngs Creek are perennial streams and have aquatic habitats. Reclamation of these channels will focus on restoration of the aquatic habitat, and on channel and landform stability."

Once the stream channels are re-established, the fishery and aquatic community should recover and colonize the reclaimed channel reaches. The SCM reclamation plan calls for replanting riparian vegetation and addressing fluvial and geomorphological characteristics for each drainage. The wetlands along Little Youngs Creek would require additional work to restore the emergent vegetation and the hydrology to sustain seasonally saturated areas. SCM has monitoring plans established for evaluating reclamation success related to ARM 17.24.634.

3.7.3.3 Agency Modified Alternative

The mitigations proposed (**Table 2.4-1)** that would reduce impacts to aquatic resources include:

- Timing construction, reclamation, and disturbance during periods of no or low flow;
- Keeping construction equipment out of saturated or riparian areas;

- Managing the grazing leases to reduce cattle impacts to wetland and riparian areas; and
- Limiting fueling to established stations.

The actions related to disturbance timing and conditions would reduce the potential for sediment delivery to the streams and to downstream areas by limiting the likelihood of erosion events occurring when soils and streamside materials are most susceptible to erosion. Reducing the potential for cattle to trample banks or introduce fecal material into the streams by managing cattle access via fencing and watering sites as part of the grazing leases would benefit areas outside of the immediate construction zone and would contribute to improving water quality and riparian habitat integrity which would benefit all kinds of wildlife, not just aquatic organisms. Similarly, limiting fuel truck traffic and conducting fueling in areas with spill containment structures in place, would reduce the likelihood of fuel or other chemical spills along the alignment. A fuel leak or spill could still occur along the roadway and potentially contaminate a waterway, but this mitigation would eliminate the most common fuel spill events, which tend to occur during fueling.

All other aspects of the Proposed Action would remain the same; therefore, all impacts described previously under the Proposed Action (see Section 3.7.3.2) not addressed by the above mitigations would be expected to persist.

3.8 Cultural Resources

This section addresses potential impacts to known cultural resources within the proposed AM5 permit boundary (**Figure 2.3-1**). Cultural resources include the locations of human activity, occupation, or usage of the environment that contains sites, features, structures, objects, or landscapes that may have important archaeological and historic values. Cultural resources encompass a wide range of prehistoric and historic sites that include, but are not limited to, Native American campsites, properties of religious and cultural significance, including Traditional Cultural Properties (TCPs) that might still be in use today, and historic resources such as buildings, structures, objects, and districts. Generally, any site of human activity older than 50 years is considered to be a potential cultural resource.

This assessment was prepared to fulfill the requirements of MEPA and MSUMRA, with the State of Montana DEQ acting as lead agency (**Table 3.8-1**). Although the USACE did consult with tribes during the permitting process for affected wetlands, there is not a project-wide federal regulatory involvement that would trigger Section 106 consultation under the National Historic Preservation Act (NHPA) of 1966, as amended. As a state agency, DEQ is required by law to consult with the State Historic Preservation Office

(SHPO) under MEPA. The SHPO office operates under a federal mandate and issues guidance for conducting cultural resource investigations based on the requirements of NEPA and Section 106 (Planning Bulletin No. 3 and 21). Therefore the terminology and guidelines established by SHPO are adhered to for investigations by state agencies that do not fall under the direct auspice of a Federal agency. As such, "historic properties" are cultural resources that meet the criteria and integrity for listing on the National Register of Historic Places (NRHP), and therefore are considered significant resources that warrant further protection.

Table 3.8-1. Applicable Rules and Regulations for Cultural Resources	
Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 17.24 Subchapter	**Summary of Requirement**
304(1)(b)	Listing of all archaeological, historical, ethnological, and cultural resources and values. Sites must be described and mapped and potentially evaluated for eligibility for national listing.
305(1)(h)	Maps of all sites listed or eligible for listing
318	Protection of public parks and historic places
1131	Limited prohibition of mining on publicly owned park or places included in the national register of historic sites unless mining thereof is approved jointly by the department and the federal, state, or local agency with jurisdiction over the park or historic sites
1132(1)(e)	Definitions of areas upon which coal mining is prohibited
ARM 2.65 Subchapter	**Summary of Requirement**
101-401	Related to preservation of burial areas.
Applicable Rules and Regulations under the Montana Strip and Underground Mine Reclamation Act	
MCA 82-4-2 Subpart	**Summary of Requirement**
202	Clarifies the intent to preserve historic, archaeologic, scientific, cultural, and recreational sites
228	Designation of lands unsuitable for coal mining

Overview and Study Area

The AM5 permit area is situated on the western edge of the northern Powder River Basin, along the dividing ridge between the South Fork of Spring Creek to the north and the head of Pearson Creek to the southeast. Pearson Creek, Squirrel Creek, Dry Creek, Youngs Creek, and Little Youngs Creek all cross through the AM5 area, flowing southeast towards the Tongue River, which is located approximately 2 miles southeast of the southern end of the permit boundary. The topography consists of steep-sided arroyos that divide upland plateaus with shallow soils and exposed sandstone bedrock outcrops. The area is underlain by shales and sandstones of the Tongue River Member of the Tertiary Fort Union formation, as well as massive sandstones and shales of the Tertiary Wasatch Formation (Vuke et al. 2007). Soil within the AM5 permit area is comprised of sandy silt formed from the weathering of local sandstone and loess deposits, and clinker beds, porcellanite, coal, scoria, and bedrock outcrops occur regularly. Vegetation within the AM5 area consists of sparse grass, sagebrush, and scattered pockets of ponderosa pine and Rocky Mountain juniper and is further described in Section 3.5. The AM5 permit area is currently used for rangeland.

The transportation corridor area of potential effects (APE) is the area within which a project may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. In this case the APE measures approximately 995 acres, and will include a haul road with an approximately 120-foot driving width and an approximately 12-foot-high by 25-foot-wide safety berm, as well as associated disturbances resulting from cut and fill, drainage control, and construction of the high voltage distribution line and water pipeline.

3.8.1 Analysis Methods

The literature reviews conducted for this EIS examined previous cultural resources projects and previously recorded cultural sites within the sections crossed by the APE. The reviews found that extensive inventory and assessment of cultural resources has been conducted in and around the AM5 area. The most important of these was a 2012 baseline inventory of about 6,000 acres (cited in Meyer and Ferguson 2012) associated with SCM's Lease by Application (LBA) II and Lease by Modification II (LBM). The area addressed by the inventory included portions of the current AM5 permit area, including the 40-acre private land parcel in Section 27 T8S, R39E. As research for the 2102 inventory, the Montana State Historic Preservation Office (SHPO) Cultural Resource Information System (CRIS) and Cultural Resource Annotated Bibliography System (CRABS) files were checked to locate previously recorded sites and past inventories. Montana SHPO conducted CRABS and CRIS file searches associated with the 2012 Class III inventory on April 11, 2011 and February 22, 2012 (Murdo 2011, 2012). At that time, early series plat maps from the General Land Office (GLO) were also checked for indications of historic activity such as roads, trails, or early settlements in the area. Montana SHPO conducted an updated CRIS/CRABS file search on May 27, 2014 (SHPO project 2014052707, Murdo 2014). The 2014 file search yielded no new information regarding the study area.

In 2013, ACR Consultants, Inc. (ACR) completed a Class I Report for CPE covering a Reasonable Foreseeable Development Area (RFDA) near the Spring Creek Coal Mine (Stubbs 2013). The AM5 area is located entirely within the RFDA, which included all or parts of sections 24, 25, and 26, T8S, R38E; sections 17, 20, 21, 26, 27, 28, 29, 32, 33, 34, and 35, T8S, R39E; sections 1, 12, 13, 24, 25, and 36, T9S, R38E; sections 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, and 35, T9S, R39E; sections 7, 18, 19, 30, and 31, T9S, R40E, and Section 1, T10S, R38E (Stubbs 2015). Literature reviews were used to assess the kind and number of cultural resources that could be affected by future projects.

In 2014, ACR completed a Class III cultural resources inventory of portions of the proposed transportation corridor within the Montana State Land Trust in Section 16, T9S, R38E (Stubbs 2014). The CRABS report compiled in support of the survey found that the CX Ranch Project Cultural Resources Inventory, completed in 1981, covered the majority of the same sections as the RFDA listed above, including Section 16. A second large-scale survey of the area was completed in 2005 by Ethnoscience for Fidelity's Pond Creek Development Area; this survey covered approximately 9,080 acres, including all of Section 16 of the Montana State Land Trust.

Field Surveys

The Montana State Trust Land located in Section 16, T9S, R39E, was previously surveyed in 2005; therefore, no new survey was conducted by ACR in 2014. However, ACR did re-record, test, and evaluate the two previously recorded sites (24BH3148 and 24BH3153, both prehistoric lithic scatters) in support of an application for a Montana Right of Way Easement in State Lands (Stubbs 2014).

In 2012, GCM conducted a 40-acre Class III inventory on private land in Section 27, T8S, R39E to supplement the AM5 permit amendment area.

From 2014 to 2015, ACR surveyed 4,101.25 block acres for the AM5 application, including all private land sections within the AM5 permit area (Stubbs 2015). The survey corridor addressed by ACR covered the entire length of the AM5 permit area and measured approximately 1,200 feet across, with extended areas at drainage crossings, ridges, and select areas where more extensive cut and fill or related disturbances may be needed.

3.8.2 Affected Environment

This section discusses the known cultural resources located within the APE. Cultural resources, which are protected under NHPA as amended, are defined as the nonrenewable, physical remains of past human activity that are more than 50 years old. Cultural resources are considered archaeological, historic, or architectural properties, buildings, structures, objects, and districts, as well as properties of traditional cultural importance to living communities. Cultural resources can be prehistoric, historic, or both prehistoric and historic in age. Historic properties are cultural resources that are protected under NHPA as amended; i.e., that meet both the criteria for significance and for integrity established by the Secretary of the Interior and are therefore eligible for listing on the NRHP.

The CRABS report for the 2013 RFDA inventory (Stubbs 2013) lists 25 cultural resource reports for the private land sections within the AM5 permit area. Most of these reports are for cultural resource studies completed for energy extraction (gas and coal), including surveys for coal mines, well pads and associated infrastructure, exploration drilling, and seismic studies. The inventory's CRIS report lists a total of 91 sites within the sections crossed by the proposed AM5 permit area, and of these, 48 sites are located within the APE. Six of these sites have been determined not eligible by the Montana SHPO, 40 were unevaluated, and 2 sites were determined eligible for the NRHP (Stubbs 2015).

The inventories of the Montana State Land Trust conducted for the CX Ranch Project in 1981, the Pond Creek Development Area in 2005, and the CPE Haul Road in 2014 found five sites, each consisting of prehistoric lithic material concentrations, located within the section. Three of the sites (24BH1065, 24BH3150, and 24BH3152) are outside the APE. Two sites (24BH3148 and 24BH3153) are located within the APE; these were re-recorded, tested, and evaluated by ACR in 2014. ACR determined that there is little potential for either site to contain significant subsurface cultural deposits, and recommended that neither be eligible for inclusion in the NRHP. Montana SHPO provided a letter of concurrence on the sites reviewed above during scoping (Wilmoth 2017).

The 2012 survey by GCM of private land in Section 27, T8S, R39E yielded one prehistoric isolated find consisting of two porcellanite secondary flakes. Isolated finds are typically not considered eligible for the NRHP because they lack context, and any data potential that they possess is exhausted during initial recording.

During their 2014 to 2015 survey for the AM5 permit amendment, ACR revisited or re-recorded 41 previously recorded sites and recorded 19 new sites and 22 isolated resources (Stubbs 2015). Fifty-two sites were recommended as not eligible for the NRHP. Two sites were recommended as eligible: 24BH2113, a prehistoric lithic scatter and resource processing site which contains buried cultural deposits, and 24BH2116/2148, a prehistoric lithic scatter and petroglyph and historic inscription site. Both of these sites are located one-half mile or more from the APE. It should be noted that only the prehistoric petroglyph portion of 24BH2116/2148 has been recommended as eligible for the NRHP. The petroglyphs are located on an east facing bluff near the base of a finger ridge in the southeast corner of the site (Stubbs 2015:-6-74-); as such, the proposed AM5 transportation corridor would be outside of the site's viewshed, and would not visually impact the site.

Five sites located outside the APE remain unevaluated; these contain rock art or stone circles and will require Native American consultation to determine their eligibility.

3.8.3 Environmental Consequences

Potential impacts to cultural resources can result from disturbance of physical elements such as buildings, lithic scatters, or rock art sites as well as changes to the appearance of an area that is culturally significant.

3.8.3.1 No Action Alternative

Literature searches and surveys have shown that while 15 archaeological sites are located within the APE, none of these meet the criteria for inclusion in the NRHP, and therefore, none are significant resources that warrant further protection. Under the No Action Alternative, there would be no additional ground disturbance with the potential to disturb historic properties (i.e., significant cultural resources). The No Action Alternative would result in no additional primary impacts to known historic properties within the APE.

3.8.3.2 Proposed Action Alternative

Literature searches and surveys have shown that while 15 archaeological sites are located within the APE for the Proposed Action Alternative, none of these meet the criteria for inclusion in the NRHP, and therefore, none are significant resources that warrant further protection. As such, the Proposed Action Alternative will result in no primary impacts to known historic properties within the APE. No mitigation would be required prior to construction. As a component of DEQ's consultation process, DEQ has requested that a tribal monitor be present during construction.

3.8.3.3 Agency Modified Alternative

As discussed above, although 15 archaeological sites are located within the APE, none of these are significant resources that warrant further protection. As such, DEQ is not expected to require mitigation of impacts to historic properties to be a component of an Agency Modified Alternative. The Agency Modified Alternative would not result in additional primary impacts to known historic properties within the APE. As with the Proposed Action Alternative, under the Agency Modified Alternative, DEQ would request that a tribal monitor and/or qualified archaeologist be present during construction.

3.9 Socioeconomics

The proposed AM5 transportation corridor is in Big Horn County near Decker, Montana. The Wyoming state line is the southern border of the AM5 area. The Crow Indian Reservation is to the west. Decker is an unincorporated area, designated as a

Census County Division by the U.S. Census Bureau. The closest incorporated town is Lodge Grass, approximately 56 miles to the northwest via Highway 338 and Interstate 90. Hardin, the County seat, is approximately 80 miles away and is the County's sole incorporated city. Due to the rural nature of the AM5 and surrounding area, for this study Big Horn County is identified as the region of influence (ROI) for socioeconomic resources including population, employment and income.

3.9.1 Analysis Methods

Data were collected from federal and state sources, including the U.S. Office of Management and Budget; U.S. Census Bureau; U.S. Bureau of Labor Statistics; U.S. Bureau of Economic Analysis; Montana Census and Economic Information Center; Montana Department of Labor & Industry; and the Big Horn County government. Spreadsheet analysis was used to determine percentages and produce graphs and tables. In all cases, the study used the latest available data that are consistent and reliable. The low population density in Big Horn County limits the amount of community-specific statistics available.

3.9.2 Affected Environment

3.9.2.1 Population

The 2010 National Census recorded a Big Horn County population of 12,865. In 2015, the population estimate increased by 276 persons or approximately two percent (US Census 2016). Decker is a designated census county division (CCD). CCDs are areas delineated by the US Census Bureau in cooperation with state, tribal, and local officials for statistical purposes. CCDs have no legal function and are not governmental units. CCD boundaries usually follow visible features and usually coincide with census tract boundaries. In 2010 and 2015, Decker CCD had a population of 89. **Table 3.9-1** provides available population statistics for Big Horn County and Decker CCD.

Table 3.9-1**.** Population Statistics for Communities in the AM5 Area (count)

	2010	**2015**
Big Horn County	12,865	13,141
Decker (CCD)	89	89

CCD: Census County Division

As shown on **Figure 3.9-1**, population for Big Horn County has steadily increased since 1970.

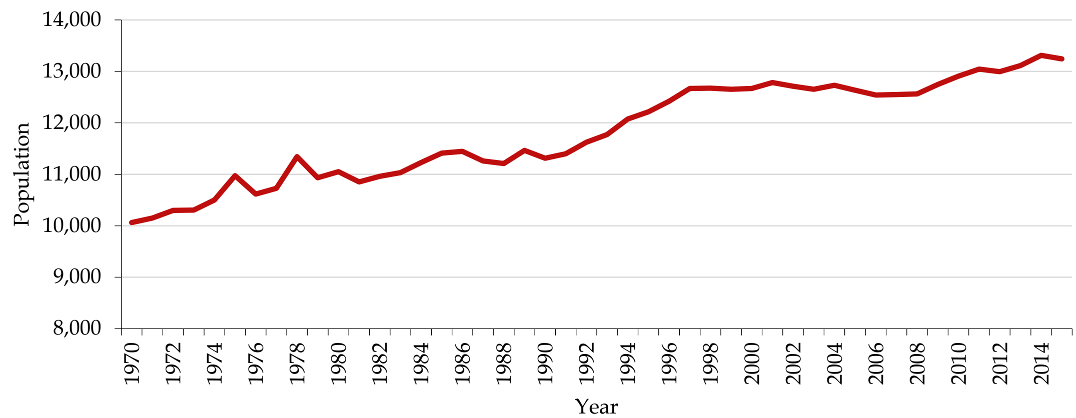


Figure 3.9-1 Big Horn County Population Trends, 1970-2015 (US Census 2016).

3.9.2.2 Employment and Income

Employment, evaluated as the number of jobs, within Big Horn County has increased within the past 15 years, with its 6,283 jobs in 2015 representing a three percent increase over the 6,118 jobs in 2000 (U.S. Bureau of Economic Analysis 2016). **Table 3.9.2** presents employment in Big Horn County, from 1970 to 2015.

Table 3.9-2 Total Employment by Decade in Big Horn County, Montana, 1970-2015.

Year	1970	1980	1990	2000	2005	2010	2015
Employed Population	4,008	5,594	4,830	6,118	6,230	6,030	6,283

Source: U.S. Department of Commerce 2016

In Big Horn County, mining is an important employment sector, accounting for 12 percent of the total employment in 2015. The U.S. Bureau of Labor Statistics does not publish mining sector annual wages and employment for Big Horn County. The Bureau reported that the average annual wage for the mining sector in Montana in 2015 was $66,400, higher than the overall average of $41,440 (U.S. Department of Commerce, Bureau of Economic Analysis 2016). It is likely that Big Horn County wages for mining are similar in that they are higher than the average of all sectors.

Table 3.9-3 compares three measures of prosperity: unemployment, average earnings per job, and median household income for the overall economy. These measures are different from the mining sector income discussed above.

Table 3.9-3 Selected Employment and Income Measures, 2015			
Location	**Annual Unemployment[1]**	**Average Earnings per Job[2]**	**Per Capita Income[3]**
Big Horn County	12.8%	$40,300	$16,244
Montana	4.0%	$41,440	$26,381
US	5.2%	$49,630	$28,930

Sources: US Department of Commerce, 2016, US Department of Labor 2016

[1]Unemployment Rate: The sum of total unemployment divided by the sum of the labor force.
[2]Average Earnings per Job: The sum of wage and salary disbursements plus other labor and proprietors' income divided by total full-time and part-time employment
[3]Per Capita Income: This is a measure of income per person. It is total personal income (from labor and non-labor sources) divided by total population.

3.9.3 Environmental Consequences

Impacts to socioeconomics include those impacts from a change in available work in a community, the likelihood that new people will move into or out of an area to fill open jobs, the additional people (families) that may accompany them, and services that these people are likely to need in the context of the community as it exists now.

3.9.3.1 No Action Alternative

The No Action Alternative assumes that SCM could continue all activities approved under its current permit; therefore, the No Action Alternative is a "status quo" approach. Impacts to socioeconomic conditions in the area would be minimal and short term under the No Action Alternative.

3.9.3.2 Proposed Action Alternative

The Proposed Action would allow the construction of the haul road within the AM5 area. To determine the appropriate level of analysis, the planned total number of personnel for the construction of the road (15) was obtained from SCM. Additionally, according to the SCM, the road would help to support from 20 to 80 temporary positions over a four year ramp up period at the mining project (Ackerman 2017e). It is conservatively assumed that all personnel would be new to the area and that all would bring their families. The number of accompanying family members was calculated using the average family size (3.18) for Big Horn County (U.S. Census Bureau 2010). This yielded a total of 64 to 254 persons, representing a 0.5 to 1.9 percent increase in the County's 2015 population. However, given the high unemployment rate in Big Horn County (**Table 3.9-3**), it could be assumed that many of these new positions would be filled by existing residents. This would minimize potential impacts to housing, schools, or social services under any alternative under consideration.

3.9.3.3 Agency Modified Alternative

The mitigations proposed (**Table 2.4-1**) that would have moderate impact on socioeconomic resources include:

- Limitations of construction and operations during certain periods;

The actions related to construction and operations timing and conditions would reduce employment due to limitations on hours available to work. This may skew the estimated number of new employees that would be hired for construction and operations towards the lower end of the estimates.

All other aspects of the Proposed Action would remain the same; therefore, all impacts described previously under the Proposed Action (see Section 3.9.3.2) would be expected to persist.

3.10 Transportation and Public Safety

The transportation resources related to the proposed AM5 haul road include the haul road itself and impacts to existing roadways in the vicinity of SCM and YCM. As previously stated, the haul road would primarily be used to transport coal from a currently permitted mine, YCM, in Wyoming to the processing facility at SCM where the coal would be processed and then transported off site under the existing SCM permit.

3.10.1 Analysis Methods

Transportation resources have been characterized using information provided in the AM5 application and elsewhere in this document.

Because the proposed haul road would be a newly constructed roadway that does not coincide with any existing roadways, the primary impacts are most likely to be where the haul road crosses existing roadways. In this case, the only major roadway that would be crossed by the haul road would be Youngs Creek Road (39R). All other private-access ranch roads would either be grade separated, rerouted or eliminated if not in use.

3.10.2 Affected Environment

SCM proposes to transport coal along the nine-mile haul road using the same 240-ton class haul trucks it operates within the mine, Komatsu 830E AC drive trucks. The roadway typical section for the haul road consists of a 120-foot wide driving surface lined with 12-foot high by 25-foot wide safety berms on either side.

Youngs Creek Road is a two-lane county road maintained by Big Horn County. It runs from the intersection of Little Owl Creek Road (County Road 83B) and Bear Creek Road on the Crow Indian Reservation to the Montana-Wyoming border, approximately 17 miles in length. The proposed haul road would intersect Youngs Creek Road within the approximate three-mile stretch between where it leaves the Crow Indian Reservation and where it crosses the state line. The location of the intersection is approximately one-half mile from the state line. See the Project Location map, **Figure 1.3-1**. Youngs Creek Road generally consists of a 24-foot wide gravel surface and a 60-foot wide right-of-way.

Existing traffic volumes were requested for Youngs Creek Road from both Big Horn County, Montana and Sheridan County, Wyoming. A summary of the reported volumes is provided in **Table 3.10-1**. The count location most relevant to the intersection location is the one north of Ash Creek Road because it was taken approximately three miles from the crossing location with very few intersecting roadways or private residences in between. If it was conservatively assumed that traffic volumes have increased at a rate of two percent per year since 2011, the resulting 2017 volume would be less than the recorded 2009 volume. Therefore, the 2009 volume of 55 vehicles per day (veh/day) will be used for the remainder of this analysis.

Table 3.10-1 Existing Traffic Volumes on Youngs Creek Road

Count Location	Average Daily Traffic Volume (veh/day)	Year Collected	Source
South of Little Owl Road (MT)	172	2004	Big Horn County Road Department
North of Hwy 338 (WY)	71	2009	Sheridan County Engineer
	63	2011	
North of Ash Creek Road (WY)	55	2009	Sheridan County Engineer
	36	2011	

Source: Big Horn County Road Department 2004; Sheridan County Engineer 2009 and 2011

It can often be assumed that the peak hour represents approximately 10 percent of the daily volume, which in this case would result in a peak hourly volume of six vehicles per hour. This hourly volume can be compared to the anticipated hourly volume on the haul road to estimate delay at the intersection between the haul road and Youngs Creek Road.

3.10.3 Environmental Consequences

3.10.3.1 No Action Alternative

Under the No Action Alternative, the AM5 amendment area would not be added to SCM's Surface Mining Permit. SCM would continue to operate the mine and process coal produced within their current permit area. No transportation-related impacts are anticipated for the No Action Alternative.

3.10.3.2 Proposed Action Alternative

SCM has six Komatsu 830E AC trucks that would be tasked with daily hauling. SCM estimates that a haul truck would cover the 18-mile round trip (9 miles each way) in 97 minutes averaging 16 mph with downhill travel restricted to 10 mph (Ackerman 2017b), including time for loading and unloading on either end. Other support traffic would average approximately two vehicles per hour along the haul road including scrapers, graders, water trucks for dust control, and lube and fuel trucks. SCM proposes to haul 24 hours per day, seven days per week. **Table 3.10-2** summarizes the total hourly trips and daily trips anticipated based on the information provided by SCM (Maunder 2017).

Table 3.10-2 Proposed Haul Road Traffic Volumes

Vehicle Type	Anticipated Average Hourly Volume (veh/hr)	Anticipated Daily Volume (veh/day)
Komatsu Haul Trucks	4	96
Other Support Traffic	2	48
Total	6	144

SCM estimates that the number of hourly trips made by the haul trucks would average approximately four trips per hour. This anticipated hourly rate will be used throughout the remainder of the analysis of transportation impacts.

The intersection between the haul road and Youngs Creek Road would be controlled with a gate system controlled by electronic sensors. SCM is proposing 24-foot wide gates on Youngs Creek Road (one on each side of the haul road) and two 55-foot wide gates on the haul road (one pair on each side of Youngs Creek Road). The gates will stay closed for the haul road and open for Youngs Creek Road until a haul truck comes through and then will alternate until the truck passes.

Due to the low hourly volumes on both roadways (6 veh/hour on the haul road and 6 veh/hour on Youngs Creek Road), delay can be estimated for the assumed worst case scenario of one single vehicle arriving on both roadways at the same time. Assuming the haul road gates would be placed approximately 100 feet apart and that the haul truck is traveling at 16 mph, it can be estimated that a vehicle on Youngs Creek Road would have a delay of 4.3 seconds while the truck is crossing. As a comparison, this level of delay is equivalent to a level of service A for a stop-controlled intersection, indicating good operation and low vehicle delay. Even if a vehicle on Youngs Creek Road had to wait for two or three trucks to pass on the haul road, the level of delay would still be equivalent to a level of service A for a stop-controlled condition. Therefore, the level of impact to Youngs Creek Road can be considered minimal, as long as adequate measures are taken to ensure the gate system operates in a safe and efficient manner. Safety measures shall ensure adequate sight distance for both haul trucks and Youngs Creek Road traffic, and adequate visibility of the gates from an appropriate distance, especially during night-time conditions.

3.10.3.3 Agency-Mitigated Alternative

The Agency-Mitigated Alternative proposes the following safety measures for the Youngs Creek Road crossing (**Table 2.4-1**):

- Design the berms on either side of the haul road at the Youngs Creek Road crossing to improve sight distance for vehicles on both Youngs Creek Road and the haul road as a precaution in case the gate malfunctions.
- Warning signage with flashers are to be installed in advance of the crossing for vehicles on Youngs Creek Road approaching the gate. If the gates are being controlled by an electronic sensor, the same sensor could be linked to the flasher on the warning sign to tell drivers they are approaching a closed gate.
- Adequately light gates with overhead lighting and/or flashers mounted on the gates to ensure they are visible at night.

As noted above, the level of impact on vehicle delay on Youngs Creek Road is minimal for the Proposed Action Alternative. These measures proposed under the Agency-Mitigated Alternative would not result in any additional delay or greater impact than the Proposed Action Alternative (see Section 3.10.3.2). Rather, they would help to improve the safety of the crossing.

3.11 Land Use

The following sections present a discussion of land uses of the AM5 area. The amendment application provides additional land use information including a variety of maps showing land use across the AM5 permit area.

3.11.1 Analysis Methods

The SCM operating permit, and various on-line databases were reviewed to evaluate land use at and near the proposed haul road. **Figure 2.3-1** presents a map of land ownership.

3.11.2 Affected Environment

Land use involves the management and modification of natural environments into built or manipulated environments such as settlements, arable fields, pastures, and managed woods. The general land use patterns in Big Horn County revolve around the dispersed human towns and settlements, industrial uses such as mining, and less-developed areas used for grazing and agricultural production.

3.11.2.1 Land Ownership and Use

The proposed haul road would be located within land owned by Arrowhead I LLC, Spring Creek Coal LLC, and one section owned by the State of Montana. The AM5 application provides a list of owners of record, lessees, and purchasers under contract for deed for all surface within the permit area and within one-half miles of the permit boundary. No mining is proposed within the Amendment area; therefore, no mineral ownership was analyzed.

According to the Big Horn County Growth Policy, outside of towns and cities, the county area is largely composed of parcels of 160 acres or greater (Big Horn County 2014). As a result, there are very few residential structures in the vicinity of the AM5 area. Those closest to the AM5 area are accessed from Youngs Creek Road.

The primary land within the AM5 area consists of pastureland, grazing land, cropland and concurrent wildlife habitat. Within the area of disturbance, 58.5 acres has been identified as Prime Farmland if Irrigated by the NRCS (USDA 2016), located in the Little Youngs Creek Valley, Youngs Creek Valley, and Squirrel Creek drainages. These areas are used for hay production, with some land irrigated.

Approximately 473 acres within the AM5 area is classified as Prime Farmland if irrigated, and an additional 509 acres classified as Farmland of Statewide Importance. 3,348 acres are considered Not Prime Farmland.

There are public lands adjacent to the AM5 area (**Figure 2.3-1**). The BLM owns several parcels of land in the vicinity. There are grazing permits issued to lessees for these parcels.

Within the AM5 area, grazing leases account for 4,141 acres, or over 98 percent of the area (**Table 2.3-1**). SCM estimates that approximately 970 acres will be disturbed to complete the haul road and approximately 303 acres will constitute the roadway footprint. According to SCM, a fence would be established around the disturbed area to prevent livestock from moving across the roadway. Whenever possible, the fenceline would be placed close to the edge of the road base, but topography and the few existing roads may necessitate some deviations (Ackerman 2017f). The fenceline would funnel wildlife and livestock to the four culverts that would carry streamflow from each of the waterways intersected.

3.11.3 Environmental Consequences

3.11.3.1 No Action Alternative

Under the No Action Alternative, the AM5 area would not be added to SCM's Surface Mining Permit. SCM would continue to operate the mine and process coal produced within their current permit area. Current grazing areas would remain unaffected and grazing would continue as permitted. No additional land use impacts are anticipated for the No Action Alternative.

3.11.3.2 Proposed Action Alternative

Under the Proposed Action there would be limited changes to land use within the mine permit boundary beyond surface disturbances that have been described in previous sections. To accommodate the proposed haul route, grazing within the AM5 area would be restricted from the area surrounding the haul road for the duration of the project. Fencing would be established around the disturbed area to limit livestock from moving across the roadway. The larger culverts could accommodate cattle and allow them to cross under the roadway, but it is unclear if these routes would be used by cattle because, similar to wildlife, the cattle may not be able to see the light at the far end of the culvert and perceive it as a passageway.

Almost all of these lands are privately-owned; therefore, the change in their use would not affect other land users in the area. One section owned by the State of Montana (Section 16, Township 9S, Range 39E) is within the proposed haul route. As indicated in the application submitted for the proposed Amendment, there is an existing Commercial Lease (#3090005) for use of this property.

Public lands adjacent to the AM5 area would continue to be accessed via routes that are currently used, specifically Youngs Creek Road and Squirrel Creek Road. SCM entered into an agreement with Big Horn County where the haul road would intersect County Road 39 (Youngs Creek Road) and ensured that the interests of the public and landowners were protected.

3.11.3.3 Agency Modified Alternative

The mitigations proposed (**Table 2.4-1)** that would reduce impacts to land use include:

- Fencing along the haul road;
- Location of stockpiles and placement of cut and fill materials; and
- Managing the grazing leases by including fencing and grazing rotations.

The actions related to fencing and managing grazing leases would reduce the potential conflicts with existing uses, primarily cattle grazing. All other aspects of the Proposed Action would remain the same; therefore, all impacts described previously under the

Proposed Action (see Section 3.11.3.2) not addressed by the above mitigations would be expected to persist.

3.12 Visual Resources

The proposed AM5 area elements and haul road would be visible to the public from limited and specific vantage points. This private property is largely visually inaccessible to the public. This section describes the visual resource in the immediate area.

The immediate area can be broadly described as the south east slopes of the Wolf Mountains, draining to the Tongue River. The slope is cut by several small, primarily ephemeral and intermittent meandering creeks, although Squirrel Creek and lower Spring Creek are perennial. The broad creek bottoms are separated by steep, eroded slopes, exposed rock ledges, rounded buttes, and ridges.

Native and improved grass lands predominate. North and east aspects hold native conifers. Creek bottoms contain intermittent deciduous woody plants and small cottonwood galleries.

3.12.1 Analysis Methods

The BLM visual resource inventory and management process was used to access visual resource impact and mitigation. Assessment of scenic quality with regards to land use, sensitivity levels (public concern) and most commonly viewed distance zones were delineated from identified key observation points accessible to the public such as nearby highways.

Other sources of information reviewed in addition to the AM5 application include:

- USGS quadrangle maps, Montana and Wyoming,
- Google Earth imagery keyed to proposed haul road locations,
- BLM visual resource management literature,
- BLM visual contrast rating work sheet, form 8400-4, (Sept., 1985), and
- National Forest landscape management system, landscape aesthetics.

3.12.2 Affected Environment

The affected visual resources extend beyond the proposed project boundary and applicant holdings. Current and historic mining activities and associated landscape disturbances adjacent to the proposed haul road are evident. Landscape disturbances seen from the public travel ways, Montana State Highway 318 and Bighorn County Road 39 R, also known as Youngs Creek Road, present limited, muted views due to distance from key observation points and concealing topography. The proposed general area is sparsely populated with few neighboring ranches. The limited access and distance from public-travelways would reduce the likelihood that AM5 area would be visible to a passing observer.

3.12.3 Environmental Consequences

3.12.3.1 No Action Alternative

Under the No Action Alternative, the AM5 would not be developed or reclaimed. The No Action Alternative would result in unchanged and unaffected visual resources and landscape.

3.12.3.2 Proposed Action Alternative

The Proposed Action Alternative would have impacts to the existing visual resources; however, these impacts would be localized and largely undetected by passing observers because of the remoteness of the private lands to be developed. The duration of impacts would begin with construction and continue through the full operation and reclamation of the AM5 corridor. The intensity of impacts would be limited due to line of sight views into the corridor from public vantage points is very limited to two vistas.

The Proposed Action Alternative would disturb approximately 970 acres. The proposed AM5 haul road cut and fill amounts to 6.5 million cubic yards of material. In places, the fill would reach up to 90 feet above existing grades at creek crossings. The large amount of proposed cut and fill would be discernable at line of sight distances of up to five miles. Proposed cut and fill slope lines, forms, and color would contrast sharply with the existing, undisturbed landscape. There are two residences near the AM5 permit area. These residences are identified as R1 and R2 on Figure 3.13-1 in the Noise section. R1 is approximately 0.5 mile west of the proposed haul road centerline near the Little Youngs Creek crossing. The road would likely be shielded from view by the willows and other riparian vegetation, but it is likely that the passing haul trucks and the high voltage power distribution line would be visible to residents. Dust and any nighttime lighting from the haul road may also be visible at R1. The residence along the CX Ranch Road (R2) near the Squirrel Creek crossing is just over 1.5 miles from the proposed haul road centerline. Local topography would completely block the road from view at this location. Nighttime lighting may be noticeable as a lighter area of the sky from R2.

The planned road crossing would be another point where the public would see aspects of the project. People crossing the haul road at Youngs Creek Road (39R) would see the roadway and gate structures and, when stopped by the gates, they would see mine-related traffic pass.

The 34.5 kv high voltage distribution line on 60-foot poles, 350 feet on center will also be visible at a distance of up to potentially three miles. The impacts resulting from this disturbance and the construction, operation, and reclamation of the AM5 area and haul road would be:

- Cut and fill slopes on haul road surfacing constructed of, or lined and topped with a thin layer of scoria that would not be revegetated, would create a striking color contrast to the existing adjacent landscape and vegetation.
- Dust from haul road construction and operations would distort atmospheric clarity and color.
- Night lighting of haul road construction and operation would interrupt dark skies and pin point human activity in an otherwise featureless, dark landscape. Halogen lighting on construction equipment and haul trucks would produce piercing, intense, moving beams of light in an otherwise darkened landscape.
- Fixed lighting along the AM5 area corridor and haul road would define the haul road alignment in a darkened landscape, thus calling attention to the manmade feature. Twenty four hour operation of the haul road would introduce the element of movement to the landscape, particularly when dark.
- Large haul road fills at creek crossings, up to 90 feet high above existing grade, would make landforms that are uncharacteristic of the landscape. The haul road would cut at right angles to the prevalent drainage pattern and create a striking visual contrast to the native and pastoral landscape.

3.12.3.3 Agency Modified Alternative

The recommendations of the AMA would have a positive impact on the visual impacts during the construction, operation, and reclamation phases. These mitigations, while primarily reducing wildlife impacts, would also benefit the visual resource. Specific mitigations would include, by phase:

Construction Phase

- High voltage distribution line alignment that follows the haul road alignment
- High voltage distribution line burial (including fiber optic line)
- Limiting and precluding nighttime construction
- Limiting the size and height of soil and topsoil stockpiles
- A defined grazing plan addressing timing, rotation, fencing, and vegetation management BMPs.

Operation Phase

- No nighttime operation and fixed lighting
- Human caused trash control
- Nesting and brood rearing core habitat management
- Air quality BMPs for dust and fumes control
- Elimination of night lighting of the haul road and equipment would protect the dark skies in an otherwise featureless, dark, unlit landscape.

- Elimination of halogen lighting on construction equipment and haul trucks would protect the night landscape from piercing, intense, moving beams of light in an otherwise darkened landscape

Reclamation Phase

- Landscape level complete restoration
- Landscape level restoration and reclamation of all AM5 area disturbed sites and removal of all roads, trails, pipelines, power lines, ponds, dams, and appurtenances would provide a more thoroughly reclaimed landscape, as described in 2.3.8, 2.3.9, 2.3.9.1, 2.3.9.2, 2.3.9.3, and 2.3.10.

These mitigations would also reduce visual impacts to R1 from dust and lighting, but the haul trucks would remain visible from this viewpoint. The mitigations to reduce light backscatter may be noticeable at R2.

3.13 Noise

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration.

3.13.1 Analysis Methods

Noise levels are quantified using units of decibels (dB). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The “A-weighting” of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz [Hz]). Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography blocks the line of sight between the source and receptor.

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain time period. The L_{eq} metric is useful because it uses a single number, similar to an average, to describe the constantly fluctuating instantaneous noise levels at a receptor location.

The 90th percentile-exceeded noise level, L_{90}, is typically considered the ambient noise level. The L_{90} is a single number that represents the noise level exceeded during 90 percent of a measurement period. Therefore, it is also an indication of the residual noise level, and among the lowest noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as bird chirps, backup alarms, vehicle pass-bys, or a single blast. If a continuous noise is audible at a measurement location, such as an engine, typically it is that noise that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment.

The 50th percentile-exceeded noise level, L_{50}, is a metric that represents the single noise level exceeded during 50 percent of a measurement period. The L_{50} is the median noise level during a period of time. The L_{max} metric denotes the maximum instantaneous sound level recorded during a measurement period.

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} can be determined using 24 consecutive one–hour L_{eq} noise levels, or estimated using measured L_{eq} noise levels during shorter time periods. The L_{dn} includes a 10-decibel penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people's higher sensitivity to noise at night when the background noise level is typically low.

A review of existing federal, state and county noise regulations, ordinances and guidelines was conducted and used to establish significance criteria for assessing Project compliance at identified noise-sensitive receptors (i.e., residences and wildlife). **Table 3.13-1** lists the noise guidelines applicable to the Project.

Table 3.13-1 Applicable Rules and Regulations Related to Noise

Applicable Rules and Regulations under the United States Code	
42 USC 4901	**Summary of Requirement**
Noise Control Act 1972	Outdoor day-night average noise level (L_{dn}) less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA 1978).
Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 61.9 Subchapter	**Summary of Requirement**
S403	Every motor vehicle shall at all times be equipped with a muffler in good working order and in constant operation to prevent excessive or unusual noise.
435	A person may not operate a motor vehicle with an exhaust system that emits a noise in excess of 95 dB, as measured by the Society of Automotive Engineers' standard j1169 (May 1998).
Applicable Rules and Regulations under Montana Strip and Underground Mine Reclamation Act	
MCA 8-4 Subpart	**Summary of Requirement**
434	Noise and visual impacts on residential areas will be minimized to the degree practicable through berms, vegetation screens, and reasonable limits on hours of operation.

Table 3.13-1 Applicable Rules and Regulations Related to Noise	
Applicable Rules and Regulations under the State of Montana	
Office of the Governor	**Summary of Requirement**
Executive Order No. 12-2015	Greater sage-grouse Core Area and General Habitat Stipulations: New project noise levels, either individual or cumulative, should not exceed 10 dBA (as measured by L_{50}) above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1 – July 15).

The Federal Transit Administration (FTA) has developed guidelines for assessing short (1-hour) and long-term (8-hour) construction activities. Assessment of construction noise includes evaluating the existing ambient noise environment, the absolute noise levels due to construction activities, the duration of construction, and the noise-sensitivity of the adjacent land use. **Table 3.13-2** summarizes the FTA construction noise guidelines at adjacent land uses.

Table 3.13-2 FTA Construction Noise Guidelines.

Adjacent Land Use	Daytime L_{eq}	Nighttime L_{eq}
Short Duration Noise Guidelines (1 hour)		
Residential	90 dBA	80 dBA
Commercial	100 dBA	100 dBA
Industrial	100 dBA	100 dBA
Moderate Duration Noise Guidelines (8 hours)		
Residential	80 dBA	70 dBA
Commercial	85 dBA	85 dBA
Industrial	90 dBA	90 dBA

Source: FTA 2006
dBA: A-weighted decibels
L_{eq}: A-weighted equivalent noise levels

In addition to the absolute limits, changes in noise levels are used to determine audibility and gauge community response to an intruding noise. Comparing the L_{eq} noise levels of a noise source to L_{90} (ambient) noise levels at a listener location helps approximate whether a noise source will be audible, and how significantly the ambient environment will change due to a new noise source. A comparison is summarized in **Table 3.13-3**.

Table 3.13-3 Audibility Guidelines		
Condition	**Perception**	**Possible Community Reaction**
$L_{eq} \le L_{90}$	Rarely heard	Minimal
$L_{90} < L_{eq} \le L_{90} + 10$	Occasionally audible	Moderate
$L_{eq} > L_{90} + 10$	Clearly audible	High
Sources: Menge 2005 and Cavanaugh 2002. L_{eq}: A-weighted equivalent noise levels L_{90}: Ambient (background) noise levels		

Construction, operation (coal hauling) and reclamation noise levels were predicted using the Cadna-A Version 2017 software from DataKustik. Cadna-A uses algorithms from the International Organization for Standardization Standard 9613-2, *Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation* (ISO 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers. Aerial photograph, topographic, and the road design data were input into the model and the ground absorption was assumed to be 0.50, which is typical for dirt.

Calculations per ISO 9613-2 conservatively assume that atmospheric conditions are favorable for noise propagation, but atmospheric conditions can vary dramatically at large distances between a noise source and a receptor. Therefore, the estimated noise levels should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris 1998). Favorable atmospheric conditions for noise propagation mean that a light wind is blowing from a source to a receiver and a well-developed temperature inversion is in place, which is typical for the time between 2 hours after sunset until 2 hours after sunrise.

3.13.2 Affected Environment

Existing man-made noise sources within 2 miles of AM5 include SCM operations, intermittent vehicles traveling on gravel roads (e.g., Youngs Creek, grazing, residential and energy development roads), ranching equipment, residential activities and aircraft flyovers. Distant train, Highway 314 traffic, Decker Mine and other energy development (oil/gas) noise sources may also be audible. Natural sound sources include wind, wildlife, birds, insects, grazing animals, and flowing water in the area creeks.

Noise receptors located within 2 miles of AM5 include two rural ranch residences, and noise-sensitive wildlife species occupying the area, including greater sage-grouse, sharp-tailed grouse, red-tailed hawks, prairie falcons, great-horned owls, bald eagles, golden eagles, and bat species identified in **Section 3.6**. There are ten greater sage-grouse leks (i.e., seven active and two unconfirmed) within 2 miles of AM5, including three active leks within 0.6 miles (Pasture, Ankney North and Ankney South) that were evaluated for noise (**Table 3.6-2**). The rural ranch residences are listed in **Table 3.13-4** and the residences and leks are shown on **Figure 3.13-1**.

Table 3.13-4 Rural Residences Located within 2 miles of AM5

Residence Location (Figure 3.13-1)	Distance and Direction from Proposed Action Haul Road Centerline
R1	0.35 miles west, adjacent to Little Youngs Creek
R2	1.57 miles east, adjacent to Squirrel Creek

The existing ambient sound levels are estimated to be approximately L_{90} 15 dBA, L_{50} 20 dBA and L_{dn} 35 dBA, which are typical for sparsely populated, rural locations that are predominantly natural (Harris 1998, EPA 1978, Blickley 2012). However, sound levels at receptors located adjacent to existing man-made and natural noise sources are intermittently higher.

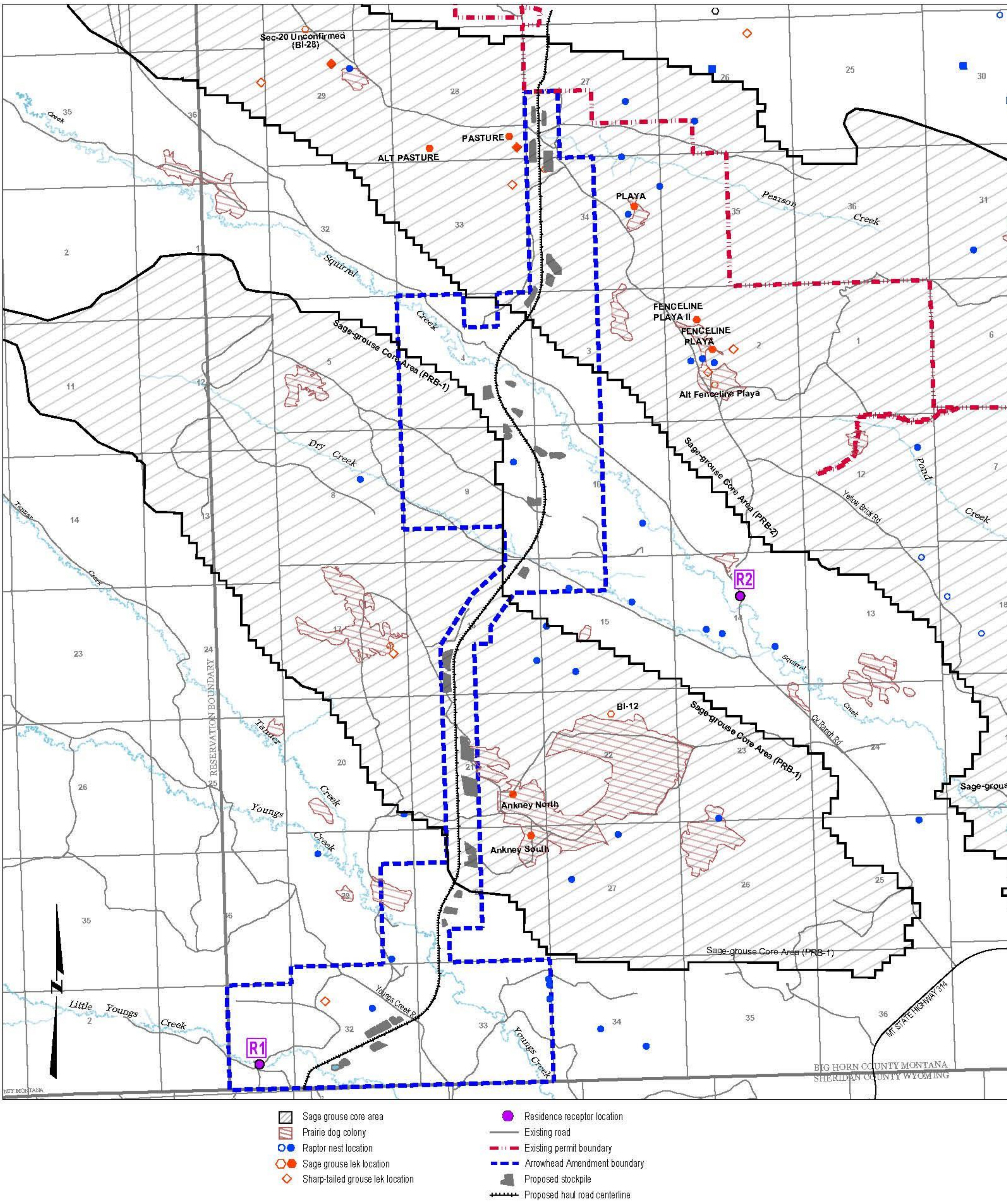


Figure 3.13-1. Proposed Haul Road and Receptor Locations, Spring Creek Mine AM5 Corridor.

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3.13.3 Environmental Consequences

3.13.3.1 No Action Alternative

Under the No Action Alternative, the AM5 permit amendment would not be approved and ongoing land uses would continue. Predicted noise impacts described under the action alternatives would not occur.

3.13.3.2 Proposed Action Alternative

The construction, hauling operations, and reclamation assumptions used for the noise predictions are summarized in **Table 3.13-5**.

Table 3.13-5 Assumptions Used for Equipment Noise.

Phase	Equipment and Estimated Noise Levels – L_{max} at 50 feet from equipment (dBA)	Other
Construction and Reclamation	Backhoe – 80 dBA Dozer – 85 dBA Excavator – 85 dBA Grader – 85 dBA Gravel Truck – 88 dBA Loader – 85 dBA Lube & Fuel Truck – 88 dBA Pick-up truck – 55 dBA Roller – 74 dBA Semi-truck – 88 dBA Scraper – 89 dBA Track hoe – 80 dBA Water Truck – 80 dBA	• Maximum 3-4 pieces diesel-powered equipment operating simultaneously in close proximity • 24 hours per day, 365 day/year • Blasting when warranted • Primary construction with scrapers and ripping by dozers • Water truck used intermittently for dust control • The existing ambient sound levels are estimated to be approximately L_{90} 15 dBA, L_{50} 20 dBA and L_{dn} 35 dBA
Operations	Komatsu 830E AC Drive – 89 dBA Grader – 85 dBA Lube & Fuel Truck – 88 dBA Pick-up truck – 55 dBA Scraper – 89 dBA Water Truck – 80 dBA	• Komatsu 830E AC Drive Haul Truck: average speed 16 mph (max 40 mph), 6 trucks, 4 pass-bys per hour, operations 24 hours per day, 365 day/year • Haul trucks equipped with thermostatic fan clutches (20-30% of typical speed) and noise blankets • Height of haul truck noise sources: top of exhaust stack = 20 feet, top of engine radiator = 18 feet • Support vehicles: daylight only, 5 days/week, 1.4 per hour (pickup trucks, water trucks, blades & fuel trucks) • The existing ambient sound levels are estimated to be approximately L_{90} 15 dBA, L_{50} 20 dBA and L_{dn} 35 dBA

Sources: Ackerman 2017b, EPA 1978, FTA 2006, Harris 1998, Maunder 2017, Patricelli 2012

Construction activities would consist of building the nine-mile haul road and the reclamation activities would deconstruct the road the end of the Project. Except for blasting, diesel-powered equipment are the loudest noise sources during construction and reclamation activities. The construction and reclamation noise vary considerably based on the phase of construction/reclamation, the equipment used for each phase, the condition of the equipment, and the varying distance between the equipment and a receptor as the equipment moves. The construction and reclamation noise will vary from day to day and hour to hour, depending on the activities occurring. Construction and reclamation noise will be localized, both short-term and temporary.

The equipment noise levels listed in **Table 3.13-5** at 50 feet away from a piece of equipment are L_{max} levels. However, these maximum noise levels do not occur the entire time the equipment is operating, and each piece of equipment is assigned a usage factor to represent the amount of time a piece of equipment operates at full power. For the equipment listed in the table, the typical usage factor is 40 percent (USDOT 2006), and this factor was used to determine the L_{eq} and L_{50} noise levels for the analysis of the mobile diesel equipment.

Once the haul road is operational, it is estimated that the haul trucks would complete four pass-bys per hour through the AM5 corridor. The loudest noise sources on a typical Komatsu 830E AC Drive haul truck are the exhaust (20 feet high) and the engine radiator (18 feet high). Other support vehicles will periodically travel through the corridor at the frequencies listed **Table 3.13-5**.

The proposed soil stockpiles and safety berm along the sides of the haul road will not effectively reduce the noise of the haul trucks. A barrier or berm must be tall enough and long enough to block the line of sight between the noise source and a receptor location to be beneficial. Since the exhaust stack and top of the radiator of the haul trucks are 18 to 20 feet above the road surface, the 12-foot high safety berm will not be useful for noise control. Although the height of some of the stockpiles will be higher, the current proposed design locations and limited length will not provide effective noise reduction over a wide area to shield the noise receptors. The proposed stockpile locations are shown on **Figure 3.13-1**.

Residential Receptors – Predicted Noise Levels

Table 3.13-6 summarizes the predicted construction, operation and reclamation L_{dn} day-night noise levels at the two residential receptor locations located within 1.5 miles of the proposed AM5 haul road (**Figure 3.13-1**). The noise level calculations are based on the assumptions listed in Section 3.13.1 and **Table 3.13-5**. The noise levels associated with the construction and reclamation phases are predicted to be the same, since the equipment and loudest operations will be similar.

Table 3.13-6. Predicted Day-Night L_{dn} Noise Levels.

Residence Location (Figure 3.13-1)	Estimated Baseline Noise Levels L_{dn} dBA[3]	Cadna-A Predicted Proposed Action Noise Levels L_{dn} dBA	Total Noise Levels L_{dn} dBA[1]	Greater than EPA L_{dn} 55 dBA Guideline?
Construction/Reclamation				
R1	435	56	56	Yes[2]
R2	435	44	45	No
Operations				
R1	435	334	438	No
R2	435	223	435	No

Notes:
[1] Total noise levels are the combination of the estimated baseline and predicted Proposed Action noise levels using logarithmic addition.
[2,3] Exceeds the EPA L_{dn} 55 dBA guideline to protect human health and welfare in residential areas **(Table 3.13-1)** (EPA 1978).

As shown in **Table 3.13-6**, the construction and reclamation L_{dn} noise levels are predicted to exceed the EPA 24-hour day-night L_{dn} 55 dBA guideline (EPA 1978) at the closest residential receptor R1, located approximately 0.35 mile west of the haul road when construction occurs in the vicinity of R1 (**Figure 3.13-1**). The haul truck operation L_{dn} noise levels are not predicted to exceed the EPA guideline at either residence.

Table 3.13-7 compares the predicted construction, operation and reclamation L_{eq} noise levels to the estimated existing ambient L_{90} noise levels at the two residential receptor locations (**Figure 3.13-1**). Conservatively assuming that three to four pieces of diesel-powered equipment listed in **Table 3.13-5** are all operating at full power and in close proximity for 8-hours, the FTA residential daytime L_{eq} 80 dBA guideline would be met within approximately 250 feet from the haul road, and the L_{eq} 70 dBA nighttime guideline would be met within 520 feet (FTA 2006). Therefore, the construction and reclamation noise is not predicted to exceed the FTA 1-hour or 8-hour residential construction noise guidelines (**Table 3.13-2**) at the houses.

Table 3.13-7. Comparison of Predicted L_{eq} and Estimated Existing L_{90} Noise Levels.

Residential Receptor (Figure 3.13-1)	Estimated Existing Ambient Noise Level (L_{90} 15 dBA)[1]	Predicted Proposed Action Noise Levels (L_{eq} dBA)	L_{eq} Greater than FTA Construction Noise Guidelines? (Table 3.13-2)	Difference ($L_{eq} - L_{90}$) (Table 3.13-3)	Perception of Noise at Residence[2,3] (Table 3.13-3)
Construction/Reclamation					
R1	215	49	No	+34	Clearly audible
R2	215	38	No	+23	Clearly audible
Operations					
R1	215	334	NA	+19	Clearly audible
R2	215	23	NA	+8	Occasionally audible

Sources: [1]Harris 1998, Menge 2005, Cavanaugh 2002

Comparing the predicted L_{eq} noise levels of the Proposed Action to the estimated existing ambient L_{90} noise levels at a receptor helps approximate whether a noise source will be audible, and how significantly the ambient environment will change due to a new noise source (**Table 3.13-3**). As shown in **Table 3.13-7**, construction and reclamation noise is estimated to be clearly audible at the two residences during activities on the adjacent roadway sections (**Figure 3.13-1**). These "high" noise levels may cause negative reactions from the resident, especially during nighttime hours.

The haul truck operations are also predicted to be clearly audible at the closest residence (R1), located 0.35 mile west, and occasionally audible at residential receptor R2, located 1.57 miles east (**Figure 3.13-1**), when haul trucks pass-by on the roadway (**Table 3.13-7**). The haul trucks may also be occasionally audible at greater distances when not masked by other manmade or natural noise sources. These "high" and "moderate" noise levels may cause negative reactions from the residents, especially during nighttime hours.

Wildlife Receptors – Predicted Noise Levels

A comparison between Proposed Action L_{50} noise levels and estimated existing baseline L_{50} noise levels can help determine noise impacts to wildlife that live, forage or breed in the area (Patricelli 2012). Numerous greater sage-grouse leks, sharp-tailed grouse leks, and raptor nests are located within 2 miles of the AM5 corridor, and many other big game, mammal and songbird species have been documented in the area (**Section 3.6**).

Table 3.13-8 summarizes the predicted construction, operation, and reclamation L_{50} median noise levels in comparison to the Montana Executive Order (EO) Greater sage-grouse Core Area and General Habitat Stipulations (**Table 3.13-1**) (State of Montana 2015). The noise level calculations are based on the assumptions listed in **Table 3.13-5** and modeled using the Cadna-A noise modeling software discussed in Section 3.13.1.

Table 3.13-8 Predicted L_{50} Noise Levels

Greater sage-grouse Lek/MFWP BI# (Figures 3.13-2 and 3.13-3)	Lek Status	Lek Distance & Direction from Proposed Action Haul Road Centerline	Estimated Existing Noise Level[2] (L_{50} dBA)	Cadna-A Predicted Proposed Action Noise Levels (L_{50} dBA)	Proposed Action L_{50} vs. Estimated Existing L_{50}	Greater than +10 L_{50} dBA Executive Order[1] Stipulation?
Construction/Reclamation						
Pasture (BI-005)	Active	0.2 mile west	20	57	+37	Yes[1]
Alt Pasture (BI-005A)	Active	40.8 miles west	220	44	+24	Yes[1]
Playa (BI-006)	Active	0.7 mile east	20	45	+25	Yes[1]
Fenceline Playa II (BI-0010A)	Active	1.2 miles east	20	38	+18	Yes[1]
Fenceline Playa (No BI#)	Active	61.3 miles east	20	37	+17	Yes[1]
Alt Fenceline Playa (No BI#)	Unconfirmed	1.4 miles east	20	38	+18	Yes[1]
Sec 20-Unconfirmed (BI-28)	Unconfirmed	1.8 miles west	20	35	+15	Yes[1]
BI-12	Unconfirmed	1.2 miles east	20	41	+21	Yes[1]
Ankney North (BI-011)	Active	0.4 mile east	20	48	+28	Yes[1]
Ankney South (No BI#)	Active	0.5 miles east	20	45	+25	Yes[1]
Operations						
Pasture (BI-005)	Active	0.2 miles west	20	22	+2	No
Alt Pasture (BI-005A)	Active	0.8 miles west	20	22	+2	No
Playa (BI-006)	Active	0.7 miles east	20	4	+4	No
Fenceline Playa II (BI-0010A)	Active	1.2 miles east	20	21	+1	No
Fenceline Playa (No BI#)	Active	1.3 miles east	20	20	0	No
Alt Fenceline Playa (No BI#)	Unconfirmed	1.4 miles east	20	21	+1	No
Sec 20-Unconfirmed (BI-28)	Unconfirmed	1.8 miles west	20	20	0	No
BI-12	Unconfirmed	1.2 miles east	20	23	+3	No
Ankney North (BI-011)	Active	0.4 miles east	20	23	+3	No

Table 3.13-8 Predicted L_{50} Noise Levels

Greater sage-grouse Lek/MFWP BI# (Figures 3.13-2 and 3.13-3)	Lek Status	Lek Distance & Direction from Proposed Action Haul Road Centerline	Estimated Existing Noise Level[2] (L_{50} dBA)	Cadna-A Predicted Proposed Action Noise Levels (L_{50} dBA)	Proposed Action L_{50} vs. Estimated Existing L_{50}	Greater than +10 L_{50} dBA Executive Order[1] Stipulation?
Ankney South (No BI#)	Active	0.5 miles east	20	23	+3	No

Note: [1]Predicted to exceed the EO stipulation L_{50} +10 dBA above baseline noise level at perimeter of greater sage-grouse lek (**Table 3.13-1**) (State of Montana 2015)
Source: [2]Patricelli 2012

Table 3.13-8 indicates the estimated Proposed Action noise levels at the ten greater sage-grouse leks (seven active and three unconfirmed) located adjacent to the proposed AM5 corridor and analyzed for noise. The construction and reclamation noise levels are predicted to exceed the EO stipulation of “no new project noise levels greater than L_{50} 10 dBA above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during breeding season (March 1 through July 15)” (State of Montana 2015) at all ten leks when activities are occurring at adjacent areas of the roadway. However, the haul road operations are not predicted to exceed the EO L_{50} noise stipulation at the leks.

The Proposed Action L_{50} noise contours are shown on **Figures 3.13-2 and 3.13-3**. As shown on the figures, the topography in the area and the roadway design affects how noise travels (Section 3.13-1). The predicted construction and reclamation L_{50} noise contours, developed using the Cadna-A noise model, are intended to indicate noise levels when the equipment is in the vicinity of a receptor. The predicted noise levels will not occur simultaneously over the entire project length, and will vary considerably from hour to hour and day to day. The predicted operation L_{50} noise contours indicate four trucks per hour driving the entire length of the nine-mile haul road (**Table 3.13-5**), and indicate noise levels when the haul trucks pass-by in the vicinity of a receptor.

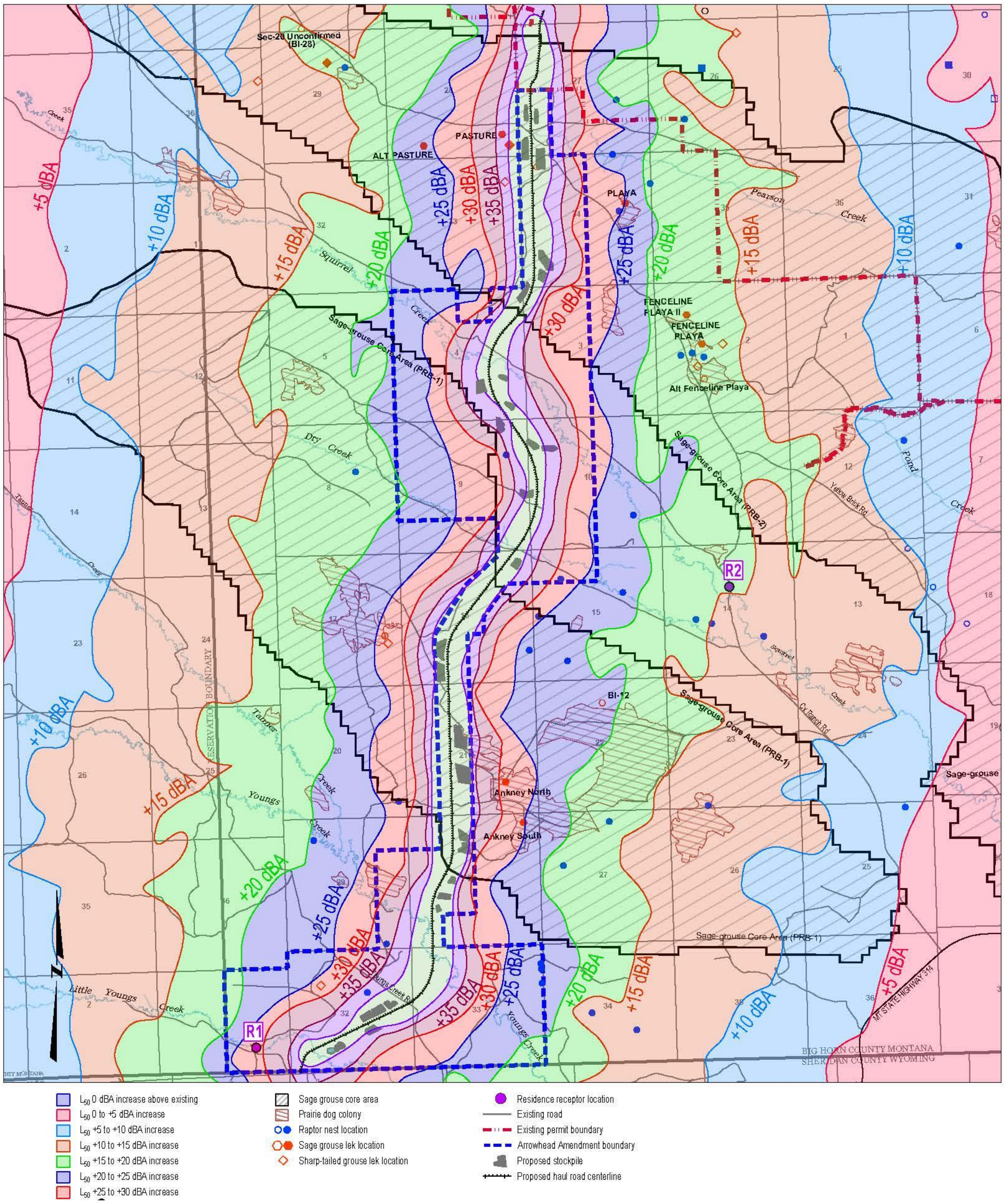

Figure 3.13-2. Predicted Construction/Reclamation L_{50} Noise Levels vs. Estimated Existing L_{50} 20 dBA, Spring Creek Mine AM5 Area.

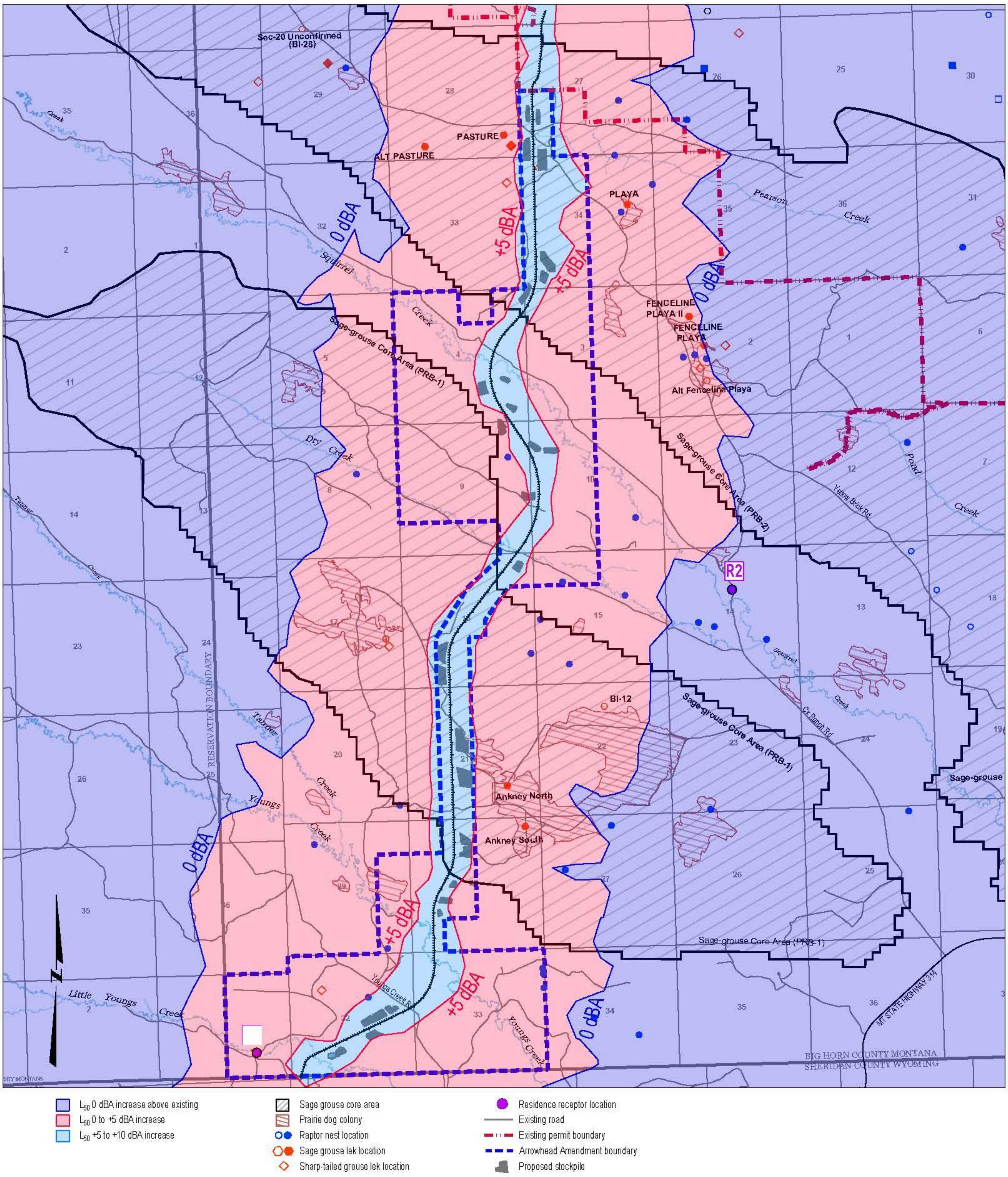

Figure 3.13-3. Predicted Operation L_{50} Noise Levels vs. Estimated Existing L_{50} 20 dBA

3.13.3.3 Agency Modified Alternative

Several of the mitigations proposed (**Table 2.4-1)** have the potential to reduce the construction, operation and reclamation noise impacts including mitigations that would modify timing of equipment usage and physical barriers to noise. Applicable mitigations include:

Construction/Reclamation

- Timing: No Surface Occupancy (NSO) between March 1 and July 15.
- Timing: To ensure EO compliance of no new project noise levels greater than L_{50} 10 dBA above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during breeding season (March 1 through July 15), conduct continuous noise level monitoring during the above timeline and hours at the closest active sage grouse lek perimeters. If noise levels are exceeded, confine construction/reclamation work to between the hours of 8:00 a.m. to 6:00 p.m.
- Timing: Limit work to daytime hours (7am to 10pm) between Youngs Creek Road and the Wyoming State Line to protect nearby residence R1 from nighttime disturbance. As an alternative, discontinue the use of this CPE residence as a rental property.
- Barriers: Strategically place cut and fill material to include barriers (e.g., berms, soil stock piles, etc.) or road cuts that act as barriers, to block the direct line-of-sight between the road, residences, greater sage-grouse leks and other noise-sensitive wildlife areas. If the barriers are high enough to block the line of sight to the equipment noise sources, a 5 dBA or greater noise reduction could be achieved (FHWA 2010a).
- Equipment: Place stationary equipment away from receptors (e.g., raptor nests, greater sage-grouse leks and residences). Turn idling equipment off. Drive equipment forward instead of backward; lift instead of drag materials; and avoid scraping or banging activities.
- Equipment: On all diesel-powered construction equipment, replace standard back-up alarms with approved broadband alarms that limit the alarm noise to 5 to 10 dBA above the background noise. Use quieter equipment with high-grade mufflers, engine intake silencers, engine enclosures, noise blankets and rubber linings.

- Blasting: Limit to daytime hours (8:00 a.m. to 6:00 p.m.) Any blasting would also comply with the requirements of Administrative Rules of Montana (ARM) 17.24.624 and 17.24.159.

As shown in **Table 3.13-8**, construction and reclamation noise levels are predicted to be 17 to 37 dBA above the estimated existing ambient noise level of L_{50} 20 dBA (Patricelli 2012). The above proposed AMA mitigations would minimize, but not eliminate all the noise of the construction or reclamation equipment, when occurring in the vicinity of a receptor. It is unlikely that the above AMA barrier and equipment mitigations would reduce the noise during construction and reclamation to less than 10 dBA above ambient at six greater sage-grouse leks **(Table 3.13-8)**. However, the timing restrictions would minimize the construction/reclamation impacts to the residences, and also comply with the EO restrictions at the leks.

Haul Truck Operations

- Timing: To ensure EO compliance of no new project noise levels greater than L_{50} 10 dBA above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during breeding season (March 1 to July 15), at the start-up of the haul truck operations conduct continuous noise level monitoring during the above timeline and hours at the closest active sage grouse lek (*Pasture*) perimeter. If noise levels are exceeded, confine hauling to between the hours of 8:00 a.m. to 6:00 p.m.

3.14 Air Quality

The AM5 project will include the installation, use, maintenance, and reclamation of a nine-mile haul road from the Wyoming-Montana border to the SCM. Construction, use, and reclamation of the road could increase the quantities of fugitive dust. Cumulative air quality effects from the road installation and use could occur on adjacent areas.

3.14.1 Analysis Methods

The air quality of a region is primarily controlled by the type, magnitude and distribution of pollutants and may be affected by regional climate. Transport of pollutants from their source areas are affected by topography and meteorology.

The primary indicator for air quality management of dust includes particulate matter less than 10 microns in size (PM_{10}) from fugitive road dust and construction activities. The most common sources for particulate matter are fly ash, carbon black soot, smoke, and fugitive dust from unpaved roads and construction sites (DEQ 2016a).

The amount of particulate dust associated with construction activities and vehicle travel depends upon the length of travel on unpaved roads, size and type of vehicle/equipment, number of vehicles/equipment, silt content of the road bed as a source of particulate matter, vehicle speed, local weather as it relates to precipitation and evaporation, and duration of the operation. Both source control and work practices can limit dust emissions from unpaved roads and disturbed soils. Dust abatement operations such as dust suppression agents for road surfaces, controlling speed of vehicle/equipment travel, fugitive dust control on material transfer, and stabilization of stockpiles or disturbed soils can greatly decrease the generation of particulate matter.

Ultimately, dust particles could contribute to poor water quality in conjunction with storm water erosion through depositional loading of sediment over the long-term.

The EPA regulates emission for on-road and non-road vehicles and engines by regulating fuel and sets emission standards on the amount of pollution a vehicle or engine can emit. This ensures that the vehicles meet federal and corporate average fuel economy standards (EPA 2017a); therefore, on-road and non-road vehicle related engine emissions are expected to meet regulations and were not addressed in this evaluation.

Spatial Boundary

The geographic scale of air quality dust analysis includes the AM5 corridor. Road dust (PM_{10}) would be confined to the AM5 corridor and would occur each time a vehicle/equipment travels the road surface or soil or aggregate is disturbed, transferred, or stockpiled. Dust would be transient in time and location and expected to largely settle out within 0.5 miles of the road.

Temporal Boundary

The temporal boundary for this analysis is an approximate 18-year period, beginning with one to two years of road related improvements followed by up to 12 years of coal hauling activities and road maintenance, followed by four years of reclamation ending in 2034.

Methods

EPA’s AP-42 document is a compilation of emission factor information for quantification of emissions from fugitive particulate matter. Chapter 11 includes a compilation of emission factors related to western surface coal mining. The details were used for comparison purposes only to evaluate differences in magnitude of particulate matter emissions from selected sources and activities (EPA 2017b).

The AP-42 equations used to estimate quantity of particulate emissions per vehicle mile traveled on unpaved roads include equation 1a (13.2.2 11/06 AP-42) for vehicles traveling on unpaved surfaces at industrial sites and equation 1b for light duty vehicles on publicly accessible roads.

The AP-42 equations used to estimate fugitive emissions from aggregate handling and storage piles related to road construction activities were obtained from 13.2.4 11/06, Aggregate Handling and Storage Piles.

The AP-42 equations used to estimate fugitive emissions from wind erosion include factors from 13.2.5 11/06, Industrial Wind Erosion.

The AP-42 equations used to estimate the quantity of particulate matter emissions from general surface mining activities such as grading roads include factors from 11.9 10/98, Western Surface Coal Mining.

The AP-42 equations determined the fractionalization of fine (PM 2.5) particulate emissions based upon 13.2.2-3, Table 13.2.2-1, Western Surface Coal Mining.

Additional information was derived from the most current Montana Air Quality Permit (MAQP) #1120-12 issued October 16, 2014 by the DEQ for SCM and deemed representative of similar activities outside of the permit boundary. The DEQ air quality permit includes all construction and operation emissions in the mine permit area, but does not address dust or other emissions from AM5 (DEQ 2014).

3.14.2 Affected Environment

The existing air quality and climatic conditions in the vicinity of the AM5 area are detailed below. It consists of a discussion of conditions which may affect regional air quality and the existing air quality in the affected area.

3.14.2.1 Topography

The AM5 area is located in Big Horn County, Montana. Topographic maps of the area indicate that overall drainage is southeast toward the Tongue River. These valleys and drainages can affect climate in the area and influence overall wind direction and the resultant dispersion of pollutants. The valley locations in and adjacent to the AM5 area have the greatest potential for cumulative concentrations of industrial and transportation emissions because up-valley winds during the daytime and down-valley winds (cold air drainage) at night can dominate local wind direction and speed more than the regional prevailing winds.

3.14.2.2 Climate and Meteorology

Climate in the AM5 permit area is generally characterized as semi-arid, or a region where the potential evapotranspiration exceeds the precipitation, but not by an extreme margin (Peel 2007).

The nearest location for recorded long-term climate data was the Sheridan Field Station, Wyoming (488160) for the period of record of 1971 to 2000. The station is located approximately 11 miles directly south of the AM5 corridor. Average annual maximum and minimum temperatures ranged from 58.9 to 29.8° Fahrenheit (F), respectively. The highest temperature was seen in July, 2002 at 109°F with highest temperatures occurring in mid to late summer. The lowest temperature was noted in December 1989 at minus 44°F with lowest temperatures occurring December through early March.

For the period of record of 1920 to 2006, average annual precipitation and total snowfall were reported to be 15.04 inches and 43.4 inches, respectively. The heaviest precipitation was reported between April and June with heaviest snowfall occurring during the month of January (Western Regional Climate Center 2017).

The Office of Surface Mining Reclamation and Enforcement's, Spring Creek Mine Environmental Assessment, dated June 2, 2016, notes that SCM operates a combined meteorological station located at the northeast border of the mine. Wind rose data tabulated from 2014 indicates that prevailing winds are primarily from the north-northwest with maximum winds greater than 25.5 miles per hour. The nearest recording station outside of the SCM station was Sheridan, Wyoming. The Western Regional Climate Center reported the annual average wind speed for 1996 to 2006 was 7.1 miles per hour (Western Regional Climate Center 2017).

3.14.2. 3 Regulatory Environment

Any proposed action must demonstrate continued compliance with all applicable state and federal air quality standards. The Clean Air Act (40 CFR part 50), requires EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Montana has adopted additional state air quality standards known as the Montana Ambient Air Quality Standards (MAAQS) (DEQ, 2016a). Refer to **Table 3.14-1**, Federal and Montana Ambient Air Quality Standards.

Table 3.14-1 Federal and Montana Ambient Air Quality Standards

Emissions	Averaging Period	Montana Standard (MAAQS)	Federal Standard (NAAQS)
Carbon Monoxide (CO)	1-hour	23 ppm[a]	35 ppm[a]
	8-hour	9 ppm[a]	9 ppm[a]
Sulfur Dioxide (SO_2)	1-Hour	0.50 ppm[c]	0.075 ppm[e]
	3-hour	--	0.50 ppm[a]
	24-hour	0.10 ppm[a]	--
	annual	0.02 ppm[b]	--
Oxides of Nitrogen (NO_x)	1-Hour	0.30 ppm[a]	0.100 ppm[h]
	annual	0.05 ppm[b]	0.053 ppm[g]
Ozone (O_3)	1-hour	0.10 ppm[a]	--
	8-hour	--	0.070 ppm[f]
PM_{10}	24-hour	150 µg/m^3 [d]	150 µg/m^3 [d]
	annual	50 µg/m^3 [d]	--

Table 3.14-1 Federal and Montana Ambient Air Quality Standards			
Emissions	**Averaging Period**	**Montana Standard (MAAQS)**	**Federal Standard (NAAQS)**
$PM_{2.5}$	24-hour	--	35 µg/m³ [j]
	annual	--	12 µg/m³ [i]
Lead (Pb)	90-Day	1.5 µg/m³ [b]	0.15 µg/m³ [b]
Hydrogen Sulfide (H_2S)	1-Hour	0.05 ppm[a]	--
Visibility	annual	3 x 10^{-5} per meter[b]	--

Source: (DEQ 2016b)

Notes:

a Not to be exceeded more than once per calendar year

b Not to be exceeded

c Violation when exceeded more than 18 times in any 12 consecutive months

d Not to be exceeded more than once per calendar year, averaged over 3 years

e 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

f Annual 4th-highest daily max. 8-hour concentration, averaged over 3 years

g Annual mean

h 98th percentile of 1-hour daily maximum concentration, averaged over 3 years

i Annual mean, averaged over 3 years

j 98th percentile, averaged over 3 years

-- Values not included in NAAQS or MAAQS and were not calculated.

The Prevention of Significant Deterioration (PSD) area classification lets states plan for land use. A geographic area with air quality that is achieving the primary standard is called an "attainment" area; areas that do not meet the primary standard are called "nonattainment" areas. Designation of a nonattainment area is a formal rulemaking process under the EPA only after air quality standards have been exceeded for several consecutive years. Similarly, areas can only be designated as attainment by EPA based on appropriate air monitoring data that demonstrates compliance with the air quality standards. Areas lacking appropriate air monitoring data are referred to as "unclassifiable" and are considered to be achieving the relevant ambient air quality standards for regulatory purposes.

There are several PSD classifications which allow differing levels of development. This acceptable growth is estimated using dispersion modeling techniques to quantify effects of current and potential pollutant sources on the surrounding airsheds. Class I areas indicate the highest level of protection while Class II may receive a greater amount of man-made pollution than Class I areas and can accommodate normal and well managed industrial growth (DEQ 2016a).

The Surface Mining Control and Reclamation Act of 1977 (SMCRA), Section 515, Environmental Protection Performance Standards [30 U.S.C. §1265] outlines general standards for soils handling. Requirements include stabilization of soils from wind erosion.

The haul road would be subject to Montana air quality regulation for reclamation and air quality. Specific requirements of those rules and regulations for the construction, operation, and reclamation phases of the proposed project are presented in **Table 3.14-2** below.

Table 3.14-2. Applicable Air Quality Rules and Regulations.

Applicable Rules and Regulations under the Administrative Rules of Montana	
ARM 17.8 Subchapter	**Summary of Requirement**
304(2)	No sources of emissions discharged into the outdoor atmosphere shall exhibit and opacity of 20% or greater averaged over 6 consecutive minutes.
308(2)	No use or authorization to use any street, road or parking lot without taking reasonable precautions to control emissions of particulate matter
308(3)	Construction/reclamation related fugitive dust emissions would need to meet an operational visible opacity of standard or 20% or less averaged over 6 consecutive minutes
ARM 17.24 Subchapter	**Summary of Requirement**
311	For strip mining operations with production exceeding 1,000,000 tons of mineral per year, an air quality monitoring program must provide sufficient data to evaluate the effectiveness of fugitive dust control practices for compliance with state and federal requirements
761(1)	Operator must employ dust controls during preparation, operations, and reclamation
761(2)	Air monitoring must be conducted in accordance with an air monitoring plan and approved by the department
Applicable Rules and Regulations under Montana Strip and Underground Mine Reclamation Act	
MCA 82-4-231 Subpart	**Summary of Requirement**
10(m)	Requires that all surface areas associated with SCM's operations be stabilized and protected in order to effectively control air pollution

3.14.2.4 Existing Air Quality

Generally, air quality within the analysis area is excellent with limited local sources of pollutants and consistent wind dispersion. All areas within and adjacent to the AM5 permit area are currently considered in attainment/ unclassifiable for all NAAQS/MAAQS pollutants. Very limited specific information is available concerning existing air quality within the immediate AM5 analysis area. However, SCM has been monitoring PM_{10} since initial mine development through 2012 and confirmed that the ambient air quality throughout the monitoring period were at or near background levels and well below the standards for PM_{10} (DEQ 2014). SCM continues to voluntarily monitor PM_{10} at the mine through its air monitoring stations (DOI 2016).

The airshed in the area of the AM5 is classified as Class II with respect to the PSD area classification. The Northern Cheyenne Reservation has elected to be redesignated as a non-federal Class I airshed. The reservation is located approximately 20 miles north of the AM5 area (DEQ 2016a) and based on prevailing wind from the north northwest, it is located upwind of the AM5.

Montana has 13 official nonattainment areas or areas not meeting the MAAQS (DEQ 2017a). Of those areas, the nearest is Lame Deer. It is located 40 miles north of the AM5 and is a nonattainment area for PM_{10}. The AM5 area is located outside of the nonattainment boundary, and based on prevailing wind from the north northwest, is located downwind of the nonattainment area. Two other nonattainment areas are located greater than 90 miles to the northwest in Billings (carbon monoxide) and Laurel (sulfur dioxide). Each area is located upwind of the Proposed Action and each of the pollutants is not associated with particulate matter.

Sources of Regional Pollution

Thirteen industrial emission sources were found in Big Horn County as of September 25, 2017. There were three mine sources, Decker Coal, Co., Spring Creek Coal, LLC, and Westmoreland Resources, Inc. Each source included PM_{10} and was located upwind of the Proposed Action. There were four stationary natural gas stations and one stationary concrete batch plant compressor. Each was not a significant source of PM_{10}.

One stationary power generator located outside of Hardin known as Rocky Mountain Power is listed as a PSD major source. It is a significant source of PM_{10} emissions with a potential to emit 140 tons per year of PM_{10}; however, its actual emissions may be considerably less. It is located north north-west of the Proposed Action and based on distance and prevailing wind, would not be considered a significant outside impact on air quality to the AM5 area.

There were four portable emission sources related to crushers/screens and asphalt plants. Each location is variable subject to change, and operation is typically seasonal (DEQ 2017b).

Mitigations

SMCRA, Section 515, Environmental Protection Performance Standards [30 U.S.C. §1265] and MSUMRA [ARM §7.24.1007] outline general standards for soils handling. Wind erosion can result in fugitive dust. Requirements of the standards include the segregation and stabilization of topsoil from wind erosion if not used in the short term. Also, all areas must be stabilized to effectively control erosion and attendant air pollution.

A best available control technology (BACT) analysis was completed as part of the current air quality permit at SCM. The analysis examined control options for emissions based on technical and environmental feasibility, and economics of each option to select the option that would be considered the best available control technology.

Water or chemical dust suppressant, restricted vehicle speed, and road maintenance were determined by DEQ to be BACT for fugitive emissions for vehicle traffic on unpaved roads in the SCM. BACT for material management to control fugitive dust emissions when handing topsoil and overburden include minimizing stockpile disturbances and promptly stabilizing the piles with vegetation or mulch. To further limit fugitive dust emissions from all activities, work practices such as high wind contingency planning should be conducted prior to high wind events by watering or chemical stabilization of areas of potential dust sources, and ceasing or reduced dust producing activities during high wind events (DEQ 2014).

3.14.3 Environmental Consequences

3.14.3.1 No Action Alternative

Under the No Action Alternative, the AM5 corridor would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Montana-Wyoming border to SCM. With the no action alternative, the lack of road development, use, and reclamation would result in no changes to air quality.

3.14.3.2 Proposed Action Alternative

The air quality analysis and permit for SCM does not address dust emissions from road development, coal hauling, reclamation, or other mine related traffic activities on the AM5 roadway, so these emissions were estimated for the Proposed Action. Since SCM will perform the final design specifics following the route selection, some design related parameters such as quantities of soil cut and fill and disturbed soil area were estimated in order to estimate fugitive dust emissions. Work practice along with control techniques can limit the quantities of fugitive dust emission from construction and use activities associated with the AM5 and were considered when estimating fugitive dust quantities.

As noted in **Table 3.14-2** above, requirements for the control of fugitive dust emissions as well as visible opacity must be met as outlined in the air quality monitoring program. Details of the program will monitor the effectiveness of the control practices to meet state and federal requirements.

Equipment used in the construction, use, and reclamation of the corridor, and other operational parameters were obtained from SCM (Ackerman 2017b, 2017h). Emission rates and control measures, known as best management practices (BMPs) already derived in the SCM Air Quality permit (DEQ 2014) for similar activities at the SCM were considered representative of conditions that would be encountered at the AM5 and used when possible. Parameters used in the derivation of emissions represent worst case scenarios or maximum expected travel.

Construction Phase

AM5 approval would result in the development of a nine-mile-long transportation corridor. The earthwork will occur 24 hours per day for approximately one to two years. Equipment will include scrapers, dozers, water trucks, graders, lube and fuel trucks, and light duty pickup trucks at a frequency of one to two vehicles per hour (Maunder 2017). The amount of particulate dust from vehicle traffic, construction activity, and wind erosion depends upon excavated material, road bed material, equipment used, and vehicle speed. AP-42 emission estimation rates were used to estimate fugitive dust emission (PM10) included in **Table 3.14-3**.

Emission factors from vehicle travel were developed using the following criteria. It was estimated that five support vehicles would travel per hour for a total of 432 miles per day (157,680 miles per year). Water trucks are large, heavy, and travel at higher average speed than most construction equipment. This results in a higher emission factor in comparison to other construction equipment. Therefore, for the purposes of estimating the overall fugitive emissions for construction equipment activities, the conservative emission factor for water trucks was chosen. Dust abatement BMPs such as road treatments and other dust suppression agents and reduced vehicles speeds can significantly reduce road dust. BMPs outlined above for vehicle travel with control efficiencies of 85 percent currently in practice with the SCM air quality permit were applied to the activity.

Emission factors for cut and fill activities, topsoil removal and dumping, were used to estimate PM_{10} emissions based on tonnage of material removed and dumped. It was estimated that a total of 825,450 tons of excavated material would be needed to construct the 12-foot-high, 25-foot wide berms on either side of the 120-foot roadway. Other excavated material includes cut and fill to construct the road surface to a suitable grade for coal hauling activities.

Table 3.14-3. Estimated Fugitive Emissions (PM_{10}) for Proposed Action

Activity Description	PM_{10} Emission Factor: PM_{10}	PM_{10} Emission Factor: Units	PM_{10} Emission Factor: Emission Factor Reference	Controlled PM_{10} Emission Factor: C_e	Controlled PM_{10} Emission Factor: Rate	Controlled PM_{10} Emission Factor: Units	Activity Rate		PM10 Emissions (tons/year)
Construction Phase									
Water Trucks, Scrapers, Graders, Lube and Fuel Trucks, Pickups [1]	3.94852	pounds/VMT	AP-42 13.2.2 (SCM AQ Permit 1120-12)	85%	0.5923	pounds/VMT	157,680	miles per year	46.7
Topsoil Removal [2]	0.0145	pounds/ton	AP-42 Table 11.9-4 (SCM AQ Permit 1120-12)		0.0145	pounds/ton	2,146,171	tons/year	15.6
Topsoil Dumping	0.001	pounds/ton	AP-42 13.2.4 (SCM AQ Permit 1120-12)		0.001	pounds/ton	2,146,171	tons/year	1.1
Wind Erosion (open acres)	0.53	pounds/acre-year	AP-42 13.2.5 (SCM AQ Permit 1120-12)		0.53	pounds/acre-year	210	acres	0.1
							Total PM_{10} Emissions - Construction Phase		**63.5**
Operation Phase									
Coal Haul	3.94852	pounds/VMT	AP-42 13.2.2 (SCM AQ Permit 1120-12)	85%	0.5923	pounds/VMT	315,360	miles per year	93.4
Water Trucks	3.94852	pounds/VMT	AP-42 13.2.2 (SCM AQ	85%	0.5923	pounds/VMT	39,420	miles per year	11.7

Table 3.14-3. Estimated Fugitive Emissions (PM_{10}) for Proposed Action

Activity Description	PM₁₀ Emission Factor: PM_{10}	PM₁₀ Emission Factor: Units	PM₁₀ Emission Factor: Emission Factor Reference	Controlled PM_{10} Emission Factor: C_e	Controlled PM₁₀ Emission Factor: Rate	Controlled PM₁₀ Emission Factor: Units	Activity Rate		PM10 Emissions (tons/year)
			Permit 1120-12)						
Haul Road Repair (Grader)	1.54255	pounds/VMT	AP-42 Table 11.9-1 (SCM AQ Permit 1120-12)	85%	0.2314	pounds/VMT	13,140	miles per year	1.5
Pickups, Fuel Trucks	0.65	pounds/VMT	AP-42 13.2.2	85%	0.10	pounds/VMT	7,675	miles per year	0.4
							Total PM_{10} Emissions - Operation Phase		**106.6**
Reclamation Phase									
Water Trucks, Scrapers, Graders, Lube and Fuel Trucks, Pickups [1]	3.94852	pounds/VMT	AP-42 13.2.2 (SCM AQ Permit 1120-12)	85%	0.5923	pounds/VMT	157,680	miles per year	46.7
Topsoil Removal [2]	0.0145	pounds/ton	AP-42 Table 11.9-4 (SCM AQ Permit 1120-12)		0.0145	pounds/ton	2,146,171	tons/year	15.6
Topsoil Dumping	0.001	pounds/ton	AP-42 13.2.4 (SCM AQ Permit 1120-12)		0.001	pounds/ton	2,146,171	tons/year	1.1

Table 3.14-3. Estimated Fugitive Emissions (PM_{10}) for Proposed Action									
	PM_{10} Emission Factor			**Controlled PM_{10} Emission Factor**					**PM10 Emissions (tons/year)**
Activity Description	**PM_{10}**	**Units**	**Emission Factor Reference**	**C_e**	**Rate**	**Units**	**Activity Rate**		
Wind Erosion (open acres)	0.53	pounds/acre-year	AP-42 13.2.5 (SCM AQ Permit 1120-12)		0.53	pounds/acre-year	210	acres	0.1
								Total PM_{10} Emissions - Reclamation Phase	**63.5**
Notes: PM_{10} - Particulate matter with an aerodynamic diameter of 10 microns or less, VMT - Vehicle Miles Traveled, C_e - Control Efficiency [1]Overall emission factor based on water truck, [2] Includes material handled by scraper									

SCM has indicated that much of the roadway would require minimal cut and fill, therefore, this estimate is based on an average of 4 feet of soils removed and redeposited as the stabilized road bed along the 120-foot width of the nine-mile long roadway. An estimated 1,320,721 tons of material would have to be removed and dumped over the nine miles of the corridor for roadway development. This resulted in and estimated 2,146,171 tons of material removed or dumped for the development of the AM5 roadway.

Following construction, the disturbed areas are susceptible to open area wind erosion until they are stabilized. Emission factors were used to estimate PM_{10} emissions due to wind erosion based on acreage. It was estimated that two 12-foot high, 25-foot wide berms and 120-foot wide road, each running nine miles, would have an exposed area of 210 acres prior to stabilization. However, it would be unlikely that the entire disturbed area would be this large or occur concurrently throughout the one to two years of the construction phase.

Both short-term and long-term stabilization practices will be used to control wind erosion. Short-term controls to mitigate fugitive dust are already incorporated into current mine practices. Application of these controls would include application of wetting agents or mulch to control fugitive dust, and managing soils to facilitate minimal handling during construction and future reclamation. Long-term emission control on these areas would include reseeding, and interim dust control such as mulching or wetting until long-term soil stabilization could be achieved.

Operation Phase

Following development of the corridor, general vehicle traffic and coal hauling will occur on the roadway until 2030. General haul road repair will occur on a regular basis to ensure a stabilized, efficient, and safe roadway. AP-42 emission estimation rates were used to estimate fugitive dust emission (PM_{10}) included in **Table 3.14-3**.

Coal hauling will include six Komatsu 830E-AC Drive trucks with an 850,650 pound (425 ton) gross vehicle weight, 362,000 pound (181 ton) empty vehicle weight, and nominal payload of 488,650 pounds (244 tons) (Komatsu 2015) to transport coal from the Montana-Wyoming border to the SCM and return. Operations would travel 18 miles round trip on the AM5 haul road between the Montana-Wyoming border and the SCM occurring 24 hours per day, all year long. The haul trucks have a maximum speed of 40 miles per hour with an average speed of 16 miles per hour. Travel downhill will be restricted to 10 miles per hour. There would be an average of 4 vehicle crossings per hour which would result in 48 round trips per day with a cycle time of 97 minutes between mines (Maunder 2017).

The amount of particulate dust generated by vehicle traffic depends on miles of unpaved road traveled, size of equipment and number of vehicles, silt content of the road bed material (potential for dust emissions), average vehicle speed, weather (number of days with rainfall), dust suppression measures, and the duration of the operation.

It was estimated that 48 round trips at 18 miles each (864 miles per day or 315,360 miles per year) would be needed per day for coal hauling. Water trucks will make up to 6 round trips per day during operations for a total of 108 miles per day or 39,420 miles per year. Haul road repair (maintenance) will include a grader making 2 round trips per day during operation for a total of 36 miles per day or 13,140 miles per year.

Additional traffic will include one to two various support vehicles per hour including pickup trucks and fuel trucks which operate during daylight hours, five days per week for a total of 7,675 miles per year (Maunder 2017).

Dust abatement BMPs such as road treatments and other dust suppression agents and reduced vehicles speeds can significantly reduce road dust. As with the construction phase, BMPs for vehicle travel with control efficiencies of 85 percent currently in practice with the SCM air quality permit were applied to the activity. The required air pollution control plan will provide sufficient data to evaluate the effectiveness of the fugitive dust control measures to comply with state and federal requirements for emissions and visible opacity thresholds and include monitoring.

Reclamation Phase

At the completion of mining activities in 2030, the reclamation of the AM5 area is planned to be completed by 2034. The earthwork will occur 24 hours per day. Areas disturbed in construction of the road will be graded to approved, post-mining contours. Equipment will include scrapers, dozers, water trucks, graders, lube and fuel trucks, and light duty pickup trucks. As with development phase, the amount of particulate dust using scrapers, dozers, grading, and vehicle traffic depends upon excavated material, road bed material, and equipment used. AP-42 emission estimation rates were used to estimate fugitive dust emission (PM_{10}) included in **Table 3.14-3.**

Fugitive dust emission estimates as PM_{10} were derived similar to those used in the development phase. It was estimated that 1 to 2 support vehicles would travel per hour for a total of 432 miles per day (157,680 miles per year). For the purposes of estimate, the conservative emission factor for water trucks was chosen to be representative of overall fugitive emissions from construction equipment activities. As with the construction phase, BMPs for vehicle travel with control efficiencies of 85 percent currently in practice with the SCM air quality permit were applied to the activity.

For excavation associated with reclamation, emission factors for topsoil removal and dumping were used to estimate PM_{10} emissions based on tonnage of material removed and dumped. It was anticipated that a total of 825,450 tons of excavated material would need to be removed to construct the 12 foot high, 25 foot wide berms on either side of the 120 foot driving lane. Other excavated material includes cut and fill to recontour the transportation corridor. As estimated during the construction phase, an estimated 1,320,721 tons of material would have to be removed and dispersed over the nine mile length of the corridor. As with the development phase, this resulted in an estimated 2,146,171 tons of material removed for reclamation of the haul road.

Areas excavated are susceptible to open area wind erosion. Emission factors were used to estimate PM_{10} emissions due to wind erosion based on acreage. As with the construction phase, it was estimated that a total of 210 acres would be disturbed during the reclamation phase. However, it is unlikely the entire AM5 permit area would be disturbed at the same time throughout the reclamation phase since the BMPs outlined in the storm water permit would address the phasing of reclamation work to limit the disturbed ground at any one time.

Both short-term and long-term stabilization practices will be used to control wind erosion. Short-term controls to mitigate fugitive dust are already incorporated into current mine practices. Application of these controls would include application of wetting agents or mulch to control fugitive dust and managing soils to facilitate minimal handing during construction and future reclamation. Long-term emission control on these areas would include reseeding, and interim dust control such as mulching or wetting until long-term soil stabilization could be achieved. The required air pollution control plan will provide sufficient data to evaluate the effectiveness of the fugitive dust control measures to comply with state and federal requirements for emissions and visible opacity thresholds and include monitoring.

Conclusion

Fugitive dust PM_{10} emissions would be confined to the AM5 corridor and could occur each time a mine vehicle used the road or activities disturb soils. The dust would be transient in time and location. Public exposure from the activities would most likely occur along publicly accessible roads and highways or occupants of residences in the area. There was one identified occupied residence located just north of the Montana-Wyoming border and within 0.5 mile west of the AM5 corridor. However, the fugitive dust is expected to largely settle out within 0.5 mile of the road corridor, and the building is located upwind given a prevailing wind direction from the north-northwest. Compaction on AM5 from the haul trucks would resist road dust mobilization, as occurs commonly in mine road hauling operations.

Emission estimates for PM_{10} calculations for 85 percent controlled fugitive dust emissions were based on dry road conditions mitigated by compaction and water treatments. However, during rainy periods (April through June) or for much of the winter period (December through early March), road PM_{10} emissions would be less due to wet, frozen, or snow cover buffering of dust mobilization potential. Estimated road dust PM_{10} emissions are greater for the Proposed Action in comparison to the No Action Alternative due to actual development and use of the transportation corridor. To further limit fugitive dust emissions from all activities, work practices such as high wind contingency planning should be conducted prior to high wind events by watering or chemical stabilization of areas of potential dust sources, and ceasing or reduced dust producing activities during high wind events.

The ambient air impact analysis and environmental assessment for the current air quality permit at SCM indicated that the 1,396 tons per year of annual emission from SCM would not cause a significant degradation to air quality. Any impact would be expected to be minor and would not likely cause or contribute to a NAAQS/MAAQS violation (DEQ 2014). The required air pollution control plan and associated monitoring will evaluate the effectiveness of the fugitive dust control measures to comply with state and federal requirements for emissions and visible opacity thresholds.

In comparison to the permitted SCM fugitive PM_{10} emissions, the Proposed Action, with portions located either adjacent to or downwind of the mine based on the prevailing wind from the north-northwest, was estimated to emit a maximum of 246.7 tons per year of PM_{10} occurring during the operation phase; therefore, its contribution to the airshed ambient air quality appears negligible in comparison to SCM.

Based on this comparison and consistent with the SCM fugitive PM_{10} emissions evaluation, the Proposed Action impacts would not cause a significant degradation or impact to air quality, would be minor, and would likely meet NAAQS or MAAQS regulatory requirements for fugitive dust emissions (PM_{10}).

3.14.3.2 Agency Modified Alternative

As discussed above, impacts to air quality under the Proposed Action would not cause substantial degradation or impacts to air quality. Mitigations proposed as part of the AMA related to hours of operation would reduce the overall amount of traffic on the road and could potentially reduce fugitive dust at those times. The Agency Modified Alternative would not result in additional primary impacts to air quality within the AM5 area.

3.15 Preferred Alternative

The rules and regulations implementing MEPA (ARM 17.4.617) require agencies to indicate a preferred alternative in the Draft EIS, if one has been identified. DEQ has identified certain aspects of the Agency Modified Alternative as the Preferred Alternative for the reasons discussed below.

During the required consultation process in MEPA, SCM voluntarily committed to implement mitigations identified in the Agency Modified Alternative which are indicated in bolded rows in **Table 2.4-1** and have been assessed in terms of their effect on each resource in the sections above. These measures are now part of the A Preferred Alternative to minimize project impacts to the environment.

DEQ worked closely with the Montana Sage Grouse Habitat Conservation Program (Sage Grouse Program), who implements the Executive Order No. 12-2015 for the sage grouse conservation strategy with guidance from the Montana Sage Grouse Oversight Team (MSGOT). In the initial development of the Agency Modified Alternative, DEQ and the Sage Grouse Program developed on-site mitigation measures for the project. These on-site mitigation measures are shaded green in **Table 2.4-1**. These on-site measures would be retained in the Agency Modified Alternative, but would not be part of the Preferred Alternative.

While conducting the environmental analysis; DEQ, the Sage Grouse Program, and SCM realized that opportunities for effective, on-site mitigations were limited. Previous anthropogenic disturbances and the cumulative impacts of potential future projects independent of the proposed haul road are already impacting the habitat for greater sage-grouse in the area. Also, any benefits of on-site mitigation would likely be negated by the project itself and the intensive nature and permit duration of the activity now being considered. Therefore, the Sage Grouse Program recommended and the MSGOT approved on April 26, 2018 a plan which includes compensatory mitigation to accomplish off-site mitigation. Plus, SCM voluntarily committed to apply this sage grouse mitigation plan as identified in **Appendix B**.

The Preferred Alternative also includes the following mitigations:

- Blasting: Limit to daytime hours and comply with the requirements of ARM 17.24.624 and 17.24.159,
- Construction Monitoring: Having a tribal representative and/or qualified archaeologist on site during construction

There are two residences that are owned and leased out by SCM. Only one of the two residences is currently occupied. During the analysis, it was identified there could be noise impacts to these residences from the construction phase of the project. The residence in T10S R38E Section 1 is occupied currently, and SCM has committed to take reasonable steps to alleviate noise impacts during the construction phase. SCM does not have any immediate plans for future occupancy of the residence in T9S R39E Section 14.

These measures would minimize noise during construction at human and wildlife receptors near the project. During construction, having a tribal representative and/or qualified archeologist present during construction could minimize disturbances to these cultural features.

DEQ has determined that all aspects of the Preferred Alternative are reasonable, achievable under current technology, and economically feasible (Section 75-1-201(1)(b)(vi)(C)(I), MCA). DEQ has consulted extensively with SCM regarding all aspects of the Preferred Alternative, has given due weight and consideration to SCM's comments to date regarding the Preferred Alternative, and will do so going forward in connection with the formulation of the FEIS (Section 75-1-201(1)(b)(vi)(C)(II), MCA).

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Chapter 4 : Cumulative, Unavoidable, Irreversible and Irretrievable, and Secondary Impacts

4.1 Related Future Actions

MEPA requires that the Proposed Action be evaluated collectively with other past and present actions (17.4.603(7), ARM). In addition, related future actions must also be considered when these actions are under concurrent consideration by any state agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures. At the time of publication of this EIS, the following projects and actions would be considered related future actions.

4.1.1 Rail Spur

The 404 permit application described in Section 2.3.11 for work in wetlands contains a request for a railroad spur for direct market shipping of coal reserves (USACE 2017). Although the rail spur would originate in Wyoming, it extends into Montana where it would tie into the main railroad line just south of Tongue River Reservoir before heading south back into Wyoming.

4.1.2 SCM Expansion (TR-1)

In 2012 SCM submitted a revision to their existing permit to add 977 acres Life of Mine (LOM) disturbance and 68 million tons of recoverable coal reserves inside the current permit boundary. The currently permitted LOM disturbance area is 6,085 acres, thus increasing the total LOM disturbance to approximately 7,062 acres (See **Figure 4.1-1**). DEQ's Coal Bureau is currently completing an EIS for this action. DEQ determined that this action would be a major revision to the SCM permit. The proposed area of disturbance includes portions of T8S, R39E, Sections 25, 26, 27, 31, and 36; and T9S, R39E, Section 6. The area of disturbance would incorporate approximately 2 miles of Pearson Creek.

The coal reserves will be added in all or portions of Township 8S, Range 39E, Sections 25, 26, 27 and 36, Township 8S, Range 40E, Sections 30 and 31, and Township 9S, Range 40E, Section 6. If TR1 is approved, SCM anticipates a reduction in annual production from 20 million tons per year to approximately 18 million tons per year. The proposed mine plan for the TR-1 would extend the mine life from 2022 to approximately 2027.

4.1.3 Additional Coal Leases

A search of the BLM's ePlanning portal (www.eplanning.blm.gov) yielded five actions in and around the SCM in Big Horn County, Montana. Four of the actions are project proposals submitted by CPE for the SCM. The fifth project is related to the Decker Mine located just to the east of SCM (**Figure 4.1-1**). **Table 4.1-1** summarizes these proposals, the total acreage involved, and other information as of the publication of this EIS. The BLM has decided to develop an EIS for the four actions proposed for the SCM (**Figure 4.1-1**). Two of the actions, Lease by Application (LBA) and Lease by Modification (LBM), would modify existing leases and increase the amount of Federal coal available for mining by SCM.

The Notice of Intent issued by the BLM also includes the following, "the actions in this Notice are consistent with Secretarial Order (S.O.) 3338, which allows preparatory work, including NEPA and other related analyses, on already-pending applications to continue while the BLM's programmatic review of the Federal coal program is pending. With respect to the sale of the coal covered by the leasing requests, unless it is shown that one of the exceptions or exclusions to S.O. 3338 applies, the BLM will not make a final leasing decision on the proposed LBA until the programmatic review has concluded. The BLM has confirmed that the LMA is not subject to S.O. 3338's leasing pause because the lease tract is less than 160 acres. As result, issuance of the LBM can occur prior to the finalization of the programmatic review."

An additional LBM was evaluated in an EA completed by the Office of Surface Mining Reclamation and Enforcement in response to a Montana District Court Order requiring OSMRE to further explain its Finding of No Significant impact (FONSI) for the 2012 federal mining plan modification related to lease MTM 94378 (OSMRE 2016).

4.1.4 Summary

In summary, these related future actions include just under 3,500 additional acres being considered for surface disturbance lease activities including surface coal mining in the vicinity of the proposed AM5 haul road corridor (**Table 4.1-1**). Of these, approximately 2,600 acres, or 75 percent of the total acres under consideration, are located within two greater sage-grouse Core Areas and approximately 550 acres fall within greater sage-grouse General Habitat. When the related future actions are added to the proposed area of disturbance for the AM5 haul road corridor (**Table 2.1-1**), the total acreage to be disturbed is approximately 4,470 acres. As a reminder, the AM5 permit area covers 4,334 acres, but only 970 acres of this would be disturbed to construct and operate the haul road (**Table 2.1-1**).

Table 4.1-1. Coal and Land Use Leases in Process with DEQ and the BLM for Spring Creek Mine and Decker Mine, Big Horn County, Montana.

Action	General Location	Total Acres	Acres in Core Sage Grouse Habitat Actual Acres / Percent of Total	Acres in General Sage Grouse Habitat / Percent of Total	Mineable Coal (tons)	Notes
SCM Major Revision (TR-1)	T8S, R39E, S 25, 26, 27, 31, and 36; T9S, R39E, S 6	977	530	35	68 million	EIS in process
			94%	6%		
SCM Lease By Application (LBA) (MTM 105485)	T 8S, R 39E S 8, 9, 17, and 35; T 9S, R 39E, S 1 and 2; T 9S, R 40E, S 6;	1,602	1,394	208	198.2 million	Sale of Federal coal
			87%	13%		
SCM Lease By Modification (LBM) (MTM 94378)	T 8S, R 39E, S 13 and 14	170	0	170	7.9 million	Sale of Federal coal
			0%	100%		
SCM Amendment to Land Use Lease (LUL) (MTM 74913)	T 8S, R 39E S 22; T 9S, R 39E, S 1; T 9S, R 40E S 7 and 8	255 (added)	191	64	NA	Would add 255 acres to existing 222 acre lease for surface use (layback, stockpiles, utility corridors)
			75%	25%		
	T 8S, R 39E S 35; T 9S, R 40E, S 6	195 (removed)	NA	NA		Acreage would be included in the LBA
SCM Amendment to Land Use Permit (LUP) MTM 96659	T 8S, R 39E S 20, 22, and 27; T 9S, R 40E, S 7 and 8	175 (added)	104	71	NA	Would provide continued access to mine monitoring and gaging stations
			62%	38%		
	T 8S, R 39E S 35	320 (removed)	NA	NA		Acreage would be included in the LBA
Decker Coal Lease Modification (MTM 101099)	T 9S, R 40E, S 4, 5, and 8	310.5			17.5 million	In preparation and planning stage, acreage is approximate.

Source: Federal Register V81, No 240

The YCM would be located in Wyoming and therefore outside of the area of assessment under MEPA.

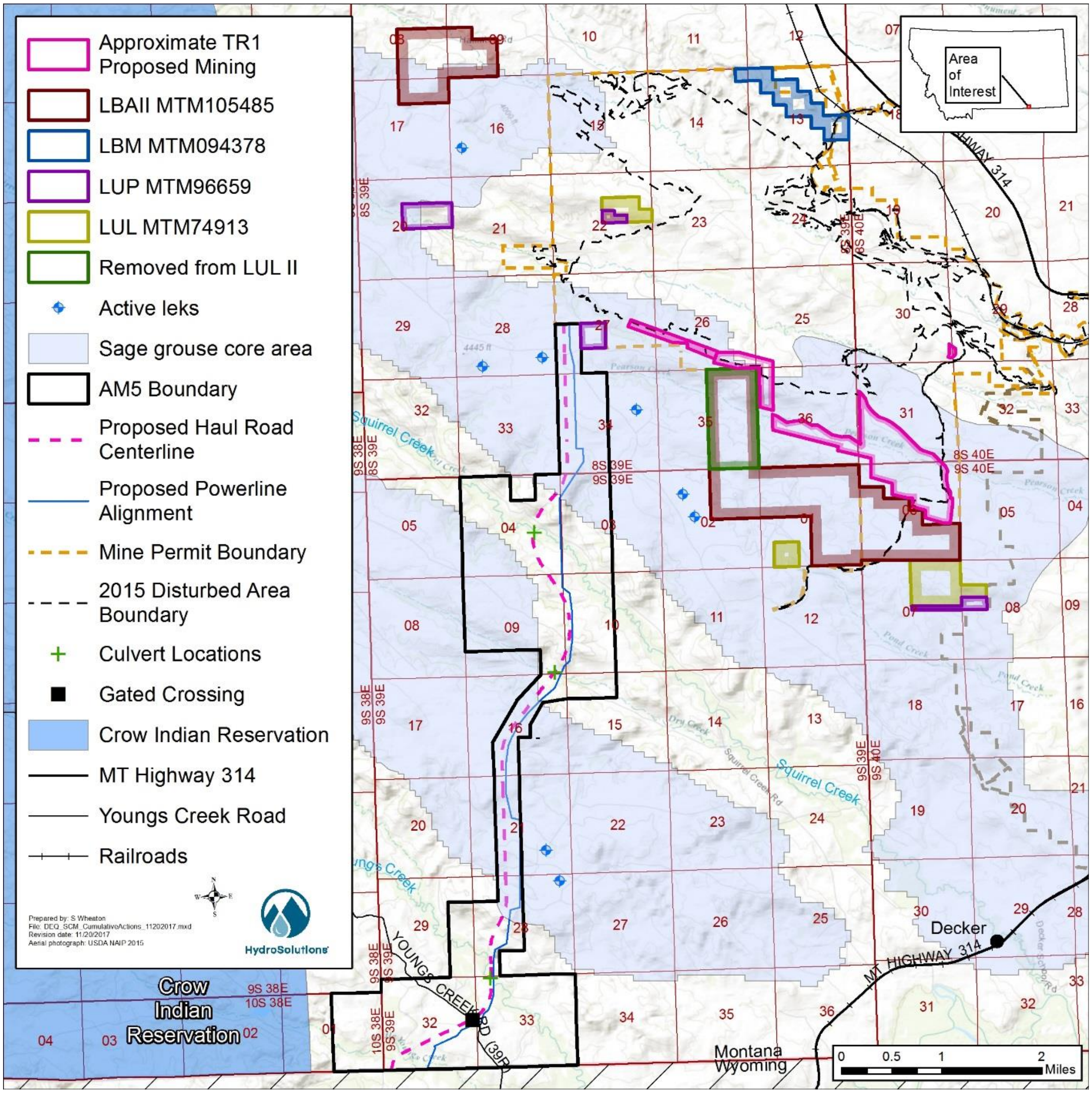

Figure 4.1-1. Map of the Related Future Actions Including Coal Leases under Consideration by the BLM and DEQ.

4.2 Cumulative Adverse Impacts

Cumulative impacts include the collective impacts of the human environment within the borders of Montana of the proposed action or any alternative under consideration in conjunction with other past, present, and future actions related to the alternative by location or generic type (75-1-220 (4), MCA). Cumulative impacts can result from individual actions that are minor, but, when combined over time with other actions, become significant. Related future actions may only be considered when these actions are under concurrent consideration by any agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures (75-1-208 (11), MCA). Cumulative impacts are assessed using resource specific spatial boundaries and often attempt to characterize trends over time scale appropriate to the alternatives under consideration. Cumulative impacts can only be assessed for resources that are likely to experience primary or secondary impacts due to an alternative.

In general, the related future actions likely to contribute to cumulative impacts of the AM5 project include the coal leases and associated activities that are currently in the environmental review process by DEQ and BLM (**Table 4.1-1**). In evaluating the potential for cumulative impacts, the related future actions are considered collectively as it would be impossible to predict the multiple possible combinations of individual lease approvals and development timings. The temporal range for the cumulative impacts evaluation would include the approximate 18-year remaining life of mine for SCM and the subsequent reclamation period.

4.2.1 Geology and Minerals

The potential for cumulative impacts to geology and minerals exists under the action alternatives. These potential impacts are discussed in the following section.

No Action Alternative

Under the No Action alternative, there would be no cumulative impacts to geology or minerals in the AM5 area because disturbance of these resources would not occur, as described in Sections 3.2.3. The disturbances associated with the related future actions described in Section 4.1 would be substantial. Coal mining the 3,500 acres would remove and redistribute large amounts of mineral resources. However, coal removal would be the primary purpose of the actions. The amount of cut and fill has not been quantified for these leases, but the predicted volume of coal to be developed provides an estimate of the level of minerals to be removed. All activities would be subject to MSUMRA and MEPA review. As for the SCM, each project permit application would include a reclamation plan compliant with current State and Federal regulations.

Specifically, with no large-scale cut and fill activities occurring, geologic material in the AM5 area would be left in place, leaving the appearance, physical characteristics, and geochemistry of the AM5 area unchanged from its present condition. However, in the absence of a transportation corridor bisecting the AM5 area, it may be more likely that development of the coal-bed methane resource in the AM5 area would re-start if natural gas market conditions improve.

Proposed Action Alternative
As described under the No Action Alternative, the potential for cumulative impacts to geology in the vicinity of SCM exists if SCM develops one or more of the coal leases described in Section 4.1. In this case, surface mining and reclamation of up to nearly 3,500 acres may occur. The impacts to geology from surface mining are expected to be similar to cut and fill carried out for the haul road in that it involves removal of native geologic material followed by backfilling with a mixture of overburden and spoils material, thus changing the geologic composition and appearance of the disturbed areas.

Agency Modified Alternative
The Agency Modified Alternative (AMA) does not specifically address geology and minerals, so all impacts described for the proposed action cumulative and secondary impacts would be expected to persist.

4.2.2 Soils and Reclamation
No Action Alternative
Under the No Action Alternative, the AM5 area would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Montana-Wyoming border to SCM. Therefore, there are no cumulative effects to soils for this alternative. The potential leases described in Section 4.1 would disturb 3,500 acres of soils as part of the coal mine development. Soils would be handled in compliance with MSUMRA and other regulations outlined in **Table 3.3.1**, which have been designed to minimize long-term effects to soil productivity and maximize revegetation potential. If one or more of the proposed coal leases described in **Table 4.1.1** is approved, there would be additional surface disturbance and soil stockpiling from the areas. Because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or types and quantities of soil resources affected beyond the estimates provided in **Table 4.1.1.** These leases are distant from the AM5 area, and effects to soils within any of the lease boundaries would not be likely to affect soil condition in the AM5 area.

Proposed Action Alternative
As stated in Section 3.3.3, the primary impacts from the Proposed Action would be moderate, short term, and local. Since the larger leases, including the TR-1, discussed under the related future actions are distant from the AM5 area, it is unlikely that any effects due to those actions would contribute to changes in soils in the AM5 area.

Therefore, there would not likely be any cumulative effects from the newly constructed haul road.

Agency Modified Alternative
No aspect of the AMA would alter the amount or distribution of soils disturbed in the AM5 area; therefore, there would not likely be any cumulative effects from a newly constructed haul road using the AMA.

4.2.3 Ground and Surface Water Resources

No Action Alternative
Little to no potential for adverse cumulative impacts are anticipated under the No Action Alternative, because if the haul road is not constructed, there will be no primary impacts to water resources. However, ground water resources could be affected if coal-bed methane production increases in the future (as a secondary impact; Section 4.4.3) or if mining in the LBA and LBM (**Figure 4.1-1**) are initiated, and ground water levels may be lowered regionally. Pearson Creek would be affected by the TR-1 lease approval and portions of its channel would be removed during coal development. Montana law addresses permanent diversion of a waterbody (**Table 3.4.1**) (17.24.317, ARM) and the USACE would require a permit for this part of the mine development. Pearson Creek is tributary to the Tongue River Reservoir. Any increases in sediment loading due to the disturbance and diversion of the stream could contribute to sediment loads in the reservoir. The Tongue River is not impaired due to sediment input (**Table 3.4.5**), but as a 303(d) listed water, controls implemented via the MPDES construction and operational permits and the CWA 401 certification must each specifically consider the downstream impacts to the secondary receiving water, the Tongue River Reservoir. This aspect of protection would apply to any of the alternatives discussed below.

Proposed Action Alternative
Water resource impacts associated with the Proposed Action Alternative are largely expected to be local to the AM5 area and limited to the streams directly affected by project activities. These streams are intermittent, but are all at least seasonally connected to the larger Tongue River system and reservoir. Any increases in sediment loads would be delivered to the Tongue River. However, all of the actions would be subject to water quality controls and permitting through the MPDES system, and the implementation of BMPs and sediment control structures should minimize additional sediment loading. Considering the distance between the AM5 permit area and related future actions (such as the LBM and LBA; **Figure 2.5-1**), it is unlikely that measurable cumulative effects to water resources would occur.

Agency Modified Alternative
Employing stationary fueling would reduce overall contamination potential and would reduce the level of risk for the tributaries of the Tongue River.

4.2.4 Vegetation and Wetlands

No Action Alternative

There would be potential cumulative impacts to vegetation and wetland resources under the No Action Alternative. Although no alterations to vegetation in the AM5 area would occur beyond the continued impacts due to land uses described under primary impacts (Section 3.5), other land uses, including the proposed LBA and LBM (**Figure 4.1-1**) would have the potential to affect vegetation in the vicinity of the SCM. These activities would clear large areas of native vegetation, but would not affect the vegetative communities in the AM5 area. The bulk of these areas (approximately 2,600 acres) would be in greater sage-grouse Core Areas (**Table 4.1-1**). Detailed vegetation surveys have not been completed in the proposed lease areas, but if we assume that the ecosystem type is similar to that observed in the AM5 in those areas, the large additional disturbance would remove native vegetation for the life of each project. Revegetation would occur, but the long regeneration time, for sagebrush in particular, would contribute to a local reduction in native plants as seed sources and a potential reduction in available habitat for greater sage-grouse and other prairie dependent species. This aspect of the cumulative impacts would be similar for all alternatives discussed below.

Weed control is required under MSUMRA and by county weed districts, but the large amount of disturbance does increase the potential for weeds to become established on the leased lands as well as on adjacent lands. It is unlikely that weeds established in the BLM lease areas would spread to the AM5 area or contribute to a cumulative change in the vegetation in the AM5 area in the absence of the AM5 approval.

If one or more of the proposed coal leases described in **Table 4.1.1** is approved, there would be additional surface disturbance and vegetation removal from the lease areas. Because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or types and quantities of vegetation resources potentially affected beyond the acreage estimates provided in **Table 4.1.1.**

Proposed Action

In general, the focused nature of the haul road disturbance would likely limit impacts to the vegetative community to the immediate area along and beside the proposed roadway. Changes to the water regime, including movement of ground and surface waters, may affect vegetation near the roadway structure and potentially downstream if surface water availability is altered. The duration of the impacts to the vegetation community mosaic, the potential for changes in community composition even after reclamation, and the time it would take the vegetation communities to become re-established after the roadway is removed would be the source of most of the cumulative impacts. The large surface leases in process on SCM lands that would be disturbed for coal mining and infrastructure would also contribute to vegetative community changes (**Table 4.1-1**). Clearing these lands either concurrently or soon after the AM5 area is developed would remove a large acreage of native vegetation with the bulk of it occurring in greater sage-grouse Core Areas.

Past reclamation of vegetative communities across the SCM has been effective and successful including development of sagebrush from seed. SCM's ability to revegetate sagebrush areas has been demonstrated by their successful Phase III bond release on reclaimed lands that they own, and the lands within the AM5 corridor would likely see similar success. However, sagebrush is a difficult community to restore and generally takes 15 or more years to become re-established. Even after 15 years, reclaimed or revegetated sagebrush areas often demonstrate lower stem density and biodiversity than undisturbed areas (Liesenfeld 2013). In addition, restoration of mature sagebrush appears to be subject to climatic factors outside of human control, and young sagebrush are more attractive to browsing wildlife than older plants, so young plants may be destroyed or damaged by wildlife (Schuman et al. 2010). When large areas of mature sagebrush are destroyed, wildlife use and occupation may shift if other undisturbed or more intact areas are available. The proposed BLM surface and coal leases in the area cover approximately 2,300 acres with most of the acres in the LBA concentrated approximately 1-2 miles east of the AM5 corridor (**Figure 2.5-1**). The potential for having large areas of native shrublands removed when combined with the acres to be removed under the Proposed Action would increase the cumulative effect of the AM5 haul road corridor on the vegetative integrity of the area and would subsequently affect wildlife dependent upon sagebrush.

Reseeding during reclamation generally results in lower plant diversity and an increase in grassland species than was present under pre-project conditions. The large acreage potentially affected by the proposed federal coal leases when considered along with the Proposed Action would contribute to the cumulative effect of this loss of vegetative diversity on the ecology of the area. Reduced plant diversity persists as seed sources for native plants are lost and other species become established. Problematic species such as cheatgrass can establish monocultures that prevent native species from returning.

Agency Modified Alternative

The AMA includes mitigations to alter grazing practices to support cheatgrass control and to rotate cattle across the grazing areas. These mitigations would reduce the impacts outside of the disturbance area and may help to conserve native seed sources and vegetation diversity. There are no other mitigations specifically targeting vegetation resources, but some of the mitigations that would reduce impacts to the soils and hydrology near riparian and wetland areas would support revegetation and reclamation efforts which may reduce the overall time to re-establish these vegetative communities.

4.2.5 Wildlife

No Action Alternative

In the absence of the AM5 haul road, coal development by the SCM and Decker mines would continue, as active and pending leases are in process and would continue to be developed (**Table 4.1.1**). However, because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or types and arrangement of wildlife habitat potentially affected beyond the acreage estimates provided in **Table 4.1.1**

Under the No Action Alternative there would be regional cumulative adverse effects from the 3,500 acres of related future actions described in Section 4.1. Most of these actions are outside of the wildlife study area. However, wildlife displaced by these actions may move into the AM5 wildlife study area, thereby increasing the population density and potentially pressure for resources. However, under the No Action Alternative, the AM5 permit amendment would not be approved and the impacts described under the action alternatives would not occur.

Greater Sage-Grouse

Research has shown greater sage-grouse persistence may not be influenced by a single anthropogenic line or point feature, but by a threshold of multiple human resources acting cumulatively (Leu and Hanser 2011). For example, although the presence of secondary roads or pipelines were not found to influence lek trends, the same research did find greater sage-grouse avoided roads (Johnson et al. 2011). Future related actions, such as amendments and new coal leases will result in the removal of at least 3,500 acres of greater sage-grouse habitat, including at least 2,600 acres of Core Areas. Not only will 3,500 additional acres be disturbed, but increased habitat fragmentation will result. The TR1 mine expansion proposal would be located within two miles of five leks. Although no leks would be mined through, fragmentation of greater sage-grouse habitats would continue, further reducing the functional habitat within this area. Greater sage-grouse populations in the SCM area are declining and whether a viable population will exist within the future is questionable, even following reclamation. In addition, the TR1, if developed fully, would extend to within approximately 0.25 mile of two active and one unconfirmed lek. If developed, it is probable the greater sage-grouse populations associated with the leks identified in **Table 3.6-2** would be extirpated, based on research looking at lek persistence associated with oil and gas development. Other currently present stressors such as oil and gas development, West Nile virus, or poor livestock grazing practices, although unknown at this time, would continue to result in further habitat fragmentation and loss of local greater sage-grouse populations.

Impacts resulting from implementation of the Proposed Action, discussed in Section 3.6.3.2 would carry forward to this alternative.

Conservation measures associated with Thunderbird Grasslands Prairie Ecosystem Association – Certificate of Inclusion and Certificate of Participation (CI/CP) (Section 1.5.3) would be implemented regardless of alternative. These management actions although not necessarily located within the AM5 project area, would benefit greater sage-grouse and their habitat adjacent to these project locations (See Section 3.6.3.1). What is unknown is whether the amount of direct habitat loss, disturbance and habitat fragmentation will collectively preclude future use by greater sage-grouse within the CI/CP project areas.

Proposed Action Alternative

Under the Proposed Action, many of the impacts described in Section 3.6.3.2 would increase if the related future actions described in Section 4.1 were implemented concurrently with the Proposed Action. Most significant is the LBA which would allow SCM to mine an additional 1,602 acres east of the AM5 area. The additional coal leases would cumulatively cause a reduction in habitat for wildlife (See Section 4.2.4, Vegetation). The potential exists for a cumulative reduction in carrying capacity for many wildlife species in the SCM area, limiting available habitat for wildlife disturbed by the Proposed Action. As land is reclaimed under the Proposed Action and any additional coal leases, these impacts would be lessened. However, wildlife dependent on the habitats which take longer to reclaim (e.g., shrub and woodland habitat), or those that would not be reclaimed (topographic features such as sandstone outcrops and cliff faces), would experience cumulative adverse impacts. This includes big game, which are dependent on the shrub habitat component for winter range.

Greater Sage-Grouse

Should the Proposed Action Alternative go forward, habitat loss and fragmentation resulting from this action, coupled with those future related actions identified in the No Action Alternative, would further fragment the habitat and local long-term population declines of greater sage-grouse would likely continue. Based on a review of the literature, even with the CI/CP measures, impacts to greater sage-grouse would result. Even though those measures identified as a part of the CI/CP would at least in part provide mitigations to greater sage-grouse, the level of habitat fragmentation would likely be more than what would be tolerated by the species. Based on inventory and monitoring conducted by SCM and others, the male breeding population in the AM5 project area is less than five birds currently. This is in the absence of the construction and utilization of the AM5 corridor, leaving little room for additional population loss.

Agency Modified Alternative

Under the Agency-Modified Alternative, cumulative impacts would be similar to those described for the Proposed Action, although less severe. The AMA would reduce impacts during the construction, operation, and reclamation of the project compared to the Proposed Action, but there would be unavoidable adverse impacts (see section 4.2.5) that, when combined with effects of the related future actions, would make any losses from the AMA more severe.

Implementation of the AMA would result in reduced noise, especially during the lekking season. Restricting construction related activities to outside of the breeding season, designing and placement of fences in order to reduce collisions and burying high voltage distribution lines in order to reduce collisions and predation, as well other measures would minimize impacts to greater sage-grouse and other species. Even with agency defined mitigations, the amount of habitat loss, as a result of the AM5 project, coupled with future related actions, habitat loss and fragmentation would be such that long-term loss of local greater sage-grouse populations is possible.

4.2.6 Aquatics

Cumulative impacts to aquatic resources would be influenced by the surface leases under consideration by the BLM. If these leases go forward, there would be potential impacts to Pearson Creek, in T 8S R 39E, Section 35 and the upper headwaters of Spring Creek in T 8S R 39E, Sections 8 and 9 from the LBA (**Figure 4.1-1**). The proposed LBA is for development of coal resources. The acreage would be mined for coal which would involve removal of overburden and surface material below the level of the natural channel for these two creeks. Cumulative impacts to the surface water are described in Section 4.2.3. The cumulative impacts to aquatic resources would include a loss of habitat for the life of the leases until reclamation is completed.

No Action Alternative

The cumulative impacts to aquatic resources described above would occur under the No Action alternative. No alterations to aquatic habitats in the AM5 area would occur beyond the continued impacts due to land uses described under primary impacts (Section 3.7). No other land uses, including the proposed LBA would affect any of the waterbodies within the AM5 area.

Proposed Action

The reaches of Pearson and Spring Creek affected by the LBA are outside of the AM5 area and would not be affected by the Proposed Action Alternative; however, changes to multiple waterbodies within the larger watershed scale would affect available aquatic resources and aquatic habitat in the generally arid landscape. The LBA areas are in the upper reaches of Pearson and Spring Creeks where the streams are ephemeral or intermittent. Based on the materials on the BLM permitting site (**Figure 4.1-1**), approximately one-half mile of Pearson Creek and three-quarters of a mile of Spring Creek would be affected by the LBA if it is approved. The Proposed Action would excavate and rechannel approximately one-tenth of a mile of Dry Creek and Squirrel Creek and slightly less linear distance on Youngs and Little Youngs Creeks in order to place the culverts described in Sections 2.3.7 and 3.7.

The impacts to the creek segments affected by the Proposed Action would be long-term as the haul road is expected to be in use for 18 years, but not permanent. Once reclamation is completed, the streams would be functional and would be expected to recover completely. Therefore, the potential for cumulative impacts to aquatic resources is minimal.

Agency Modified Alternative

The AMA includes mitigations to alter grazing practices to rotate cattle across the grazing areas which may reduce their use of riparian and stream channel areas. These mitigations would reduce the impacts outside of the disturbance area and may help to conserve stream integrity. Although the grazing practices are not part of the AM5 haul road, reducing the negative effects of cattle on creeks in the area would be beneficial, and is part of the AMA. There are no other mitigations specifically targeting aquatics, but some of the mitigations that would reduce impacts to the soils and hydrology near riparian and wetland areas would support revegetation and reclamation efforts which may reduce the overall time to re-establish these vegetative communities.

4.2.7 Cultural Resources

No Action Alternative

As the No Action Alternative would not impact known historical properties, there would be no cumulative impacts to historical properties within the AM5 area. If one or more of the proposed coal leases described in **Table 4.1.1** is approved, there would be additional surface disturbance and potential for impacts to any cultural resources the lease areas. These areas would be subject to cultural resource surveys as part of the permitting process, which is designed to identify and avoid impacts to such areas. However, because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or types and quantities of cultural resources potentially affected beyond the acreage estimates provided in **Table 4.1.1**

Proposed Action Alternative

As the Proposed Action would not impact known historical properties, there would be no cumulative impacts to historical properties within the AM5 area.

Agency Modified Alternative

As the Agency Modified Alternative would not impact known historical properties, there would be no cumulative impacts to historical properties within the AM5 area.

4.2.8 Socioeconomics

No Action Alternative

As the No Action Alternative would not create measurable impacts to the ROI, there would be no cumulative impacts to socioeconomics because of the AM5 project. The multiple leases proposed may result in an increased life for the mines (SCM and Decker) and thus may prolong the jobs supported by these mines. However, since the timing of these actions is uncertain, it is difficult to know if the new areas would require substantial numbers of new employees or increase the duration of existing employee positions (Federal Register V81, No 240). Generalized cumulative impacts would be beneficial to the local economy, but the duration and intensity of those benefits is hard to estimate.

Proposed Action Alternative

The predicted change in population (1.9 percent) for the development of the AM5 project is not large enough to generate a perceptible cumulative impact to the socioeconomic conditions in Big Horn County for either action alternative. The overall impact of the Proposed Action would be beneficial, but the effects would be localized and would not affect the economic climate in the community. As indicated, there will be jobs generated during the construction of the proposed haul road, as well as permanent positions added over time. The proposed road improvements are not likely to contribute substantially to cumulative effects to socioeconomics.

If the BLM coal leases are developed (Section 4.1), additional new jobs may be generated. However, since the timing of these actions is uncertain, it is difficult to know if the new areas would require substantial numbers of new employees or increase the duration of existing employee positions. Again, generalized cumulative impacts would be beneficial to the local economy, but the duration and intensity of those benefits is hard to estimate.

Agency Modified Alternative

No aspect of the AMA addresses the number of jobs or other socioeconomic aspects of the project. Therefore, the AMA would not alter the cumulative impacts expected under the Proposed Action.

4.2.9 Transportation and Public Safety

The Related Future Actions include several additional coal leases being considered for SCM. There may be cumulative impacts associated with hauling coal from these additional areas, but they would not affect the transportation and public safety impact assessment because it is not anticipated that these haul routes would coincide with Youngs Creek Road, and therefore would not result in additional road crossings which would affect the level of safety of Youngs Creek Road

4.2.10 Land Use

No Action Alternative

There would be little to no potential cumulative impacts to land uses under the No Action Alternative. No alterations to land use in the AM5 area would occur beyond the continued impacts described under primary impacts (Section 3.11). Other land uses, including the proposed LBA and LBM (**Figure 2.5-1**), would increase mining activity in the vicinity of the SCM, but would not affect the AM5 area.

Proposed Action Alternative

The focused nature of the haul road disturbance would likely limit impacts to the immediate area along and beside the proposed roadway. Because the large area of the AM5 area is part of existing grazing leasing, disturbance to vegetation could have lasting impacts on the future grazing of the area. The large tracts of land included in the proposed BLM coal leases would contribute to changes in land use across the larger area during those projects. The acreage of the AM5 disturbance area would add to this change in the landscape. However, there is no reason to assume that pre-project land uses would not be re-established after reclamation is completed.

Agency Modified Alternative

No aspect of the AMA addresses the number of acres to be removed from current land uses or other aspects of the project related to land use. Therefore, the AMA would not alter the cumulative impacts expected under the Proposed Action.

4.2.11 Visual Resources

This section describes potential changes to the viewshed and the cumulative effects area surrounding the SCM and AM5 haul road that would be visible from publicly accessible viewpoints such as county roads. Aspects of the project that would affect air quality are discussed under Section 4.2.13.

No Action Alternative

Under the No Action Alternative, the AM5 haul road would not be developed or reclaimed. The No Action Alternative would result in unchanged and unaffected visual resources and landscape. If one or more of the proposed coal leases described in **Table 4.1.1** is approved, there would be additional surface disturbance and vegetation removal from the lease areas, some of which may be visible from public access points. However, because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or arrangement of areas potentially affected beyond the acreage estimates provided in **Table 4.1.1**

Proposed Action Alternative

The Proposed Action Alternative would have impacts to the existing visual resources; however, these impacts would be localized and largely undetected by passing observers because of the remoteness of the private lands to be developed. The duration of impacts would begin with construction and continue through the full operation and reclamation of the AM5 corridor. The intensity of impacts would be limited due to line of sight views into the corridor from public vantage points is very limited to two vistas.

Agency Modified Alternative

No aspect of the AMA addresses the number of acres to be removed from current land uses or other aspects of the project related to visual appearance of the haul road. Therefore, the AMA would not alter the cumulative impacts to visual resources expected under the Proposed Action.

4.2.12 Noise

No Action Alternative

With the No Action Alternative, area noise levels would still increase in the vicinity of the northern AM5 corridor, with the development of the proposed future surface disturbance lease activities (i.e., mining). Negative adverse noise impacts may occur at the Fenceline Playa II, Fenceline Playa, and Alt Fenceline Playa greater sage-grouse leks if the adjacent leases are developed (**Figures 3.13-2 and 4.1-1**). However, since the timing of these actions is uncertain, it is difficult to predict the intensity or duration of these potential additional impacts.

Proposed Action

Potential cumulative impacts on noise include conflicts with existing noise-sensitive receptors, including residences, greater sage-grouse, and other noise-sensitive wildlife, such as raptors. With the development of the Proposed Action, these impacts would be intensified where other existing noise sources have already affected ambient levels, such as adjacent SCM operations, oil and gas extraction activities, traffic on local roads and grazing activities. Possible future actions described in **Section 4.1** would also increase the ambient noise levels in the area, including the addition of a rail spur and additional coal extraction and production (**Table 4.1-1**). Negative cumulative adverse noise impacts may occur at the Fenceline Playa II, Fenceline Playa, and Alt Fenceline Playa greater sage-grouse leks if the adjacent leases are developed, in addition to the Proposed Action, thereby greatly increasing ambient noise levels (**Figures 3.13-2 and 4.1-1**).

Agency Modified Alternative

The proposed AMA mitigations listed in **Table 4.4-1** would not reduce all of the noise of the construction or reclamation activities when operating, but the cumulative noise impacts under the AMA would be slightly reduced from those described under the Proposed Action if noise mitigations are implemented. However, negative cumulative adverse noise impacts may occur at the Fenceline Playa II, Fenceline Playa, and Alt Fenceline Playa greater sage-grouse leks if the adjacent leases are developed, in addition to the AMA, thereby greatly increasing ambient noise levels (**Figures 3.13-2 and 4.1-1**).

4.2.13 Air Quality

No Action

Under the No Action Alternative, the AM5 would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Montana-Wyoming border to the SCM. With the No Action Alternative, air quality effects would essentially remain unchanged. Therefore, there would be no cumulative impact with road development, coal hauling, or reclamation activities within the proposed AM5 corridor. However, future development of other regional actions from additional lease activities may disturb just under 3,500 acres in the vicinity of the Proposed Action and may contribute PM_{10} to the regional airshed.

Proposed Action

Air resources are somewhat unique in that the past impacts to air quality are not usually evident or cumulative. Mobile and construction source emissions associated with coal hauling and mine related travel over the AM5 area associated with the Proposed Action would be cumulative with permitted mine emission sources, recreational traffic in the area, wildfire, and other private land activities. The mine air quality permit (DEQ 2014) for the SCM considered cumulative effects in the area for air quality data and trends in authorizing the permit and states,

> "The cumulative and secondary impacts from the proposed project [SCM] on physical and biological receptors in the immediate area due to an increase in emissions from the proposed project [SCM] would be expected to be minor. Air pollution from the facility [SCM] would be controlled by Department-determined BACT, as discussed in Section III of the permit analysis, along with the limitations and conditions in MAQP #1120-12. The Department believes that this facility could be expected to operate in compliance with all applicable rules and regulations as outlined within the air quality permit."

There are no other major sources of air pollutants in the area; however, BLM's ePlanning portal indicated six actions in and around the SCM (**Table 4.1-1**). These actions may be developed in the future. As shown on **Figure 4.1-1**, four SCM development parcels are located north of the AM5 while the remainder of the parcels are located to the east of the AM5. In all cases, the parcels are located either parallel and north or downwind based on prevailing wind direction and are thus not expected to directly impact the AM5. However, each emission source would need to be covered under an air quality permit should the emissions for the proposed activities exceed permitting thresholds or amended to SCM's current permit and similar to the Proposed Action, each lease would have to meet the applicable requirements outlined in **Table 3.14-1**.

Dependent upon emission thresholds, cumulative effects within the airshed from the proposed lease developments would be considered through demonstrated compliance with ambient air quality standards with each MAAQS and visibility opacity requirements (ARM 17.8.308(3)) as part of the air quality permit development. In addition, the leases would undergo separate EIS related impacts analysis which would include background emission from the current SCM permit boundary and the emissions from the proposed AM5 corridor addressed here.

The Proposed Action is located outside and downwind of any nonattainment PM_{10} boundaries in the area and minimal in comparison to permitted fugitive emission sources at the SCM. In addition to the specific emission controls, air monitoring stations operated by the SCM are used to measure current air quality and to ensure that ambient air quality standards are maintained. The cumulative effects of mobile road dust and construction activity particulate PM_{10} sources associated with the Proposed Action have been considered based on magnitude, time frame, climate, meteorology, work practices, source control, and location. Similar to the current emissions at the SCM, cumulative impacts to physical and biological aspects on the physical and biological environment in the immediate area as a result of the Proposed Action are expected to be local and minor.

Agency Modified Alternative

None of the proposed mitigations would significantly reduce or eliminate fugitive dust; therefore, the cumulative impacts under the AMA would be the same as those described under the Proposed Action.

4.3 Unavoidable Adverse Impacts

Unavoidable adverse impacts are those environmental consequences of an action alternative that cannot be avoided, either by changing the nature of the action or through mitigation.

4.3.1 Geology and Minerals

No Action

There would be no unavoidable adverse impacts to geology and minerals from the AM5 haul road under the No Action Alternative because disturbance of these resources would not occur, as described in Sections 3.2.3.

Proposed Action Alternative

Impacts to geology under the Proposed Action Alternative are related to the removal of large volumes of rock to use as fill material, and the replacement of this rock during reclamation with the fill mixture, which will have different physical and chemical characteristics compared to the original rock, as discussed in Section 3.2.3. Adverse changes to geochemistry are addressed through strata quality sampling requirements in MSUMRA, but additional sampling and careful placement of certain fill materials during reclamation could further reduce the potential for impacts to geochemistry.

Agency Modified Alternative

None of the AMA proposed mitigations would eliminate the need for cut and fill; therefore, the unavoidable impacts to geologic resources would be the same under this alternative as for the Proposed Action.

4.3.2 Soils and Reclamation

No Action

Similar to the geologic resources, there would be no unavoidable adverse impacts to soils under the No Action Alternative because disturbance of these resources would not occur as part of the AM5 haul road development, as described in Sections 3.3.3.

Proposed Action Alternative

To construct the roadway, hundreds of acres of soils will be disturbed or displaced until the reclamation phase of the project has been completed. A minor amount of soil would be permanently lost through wind and water erosion and would be unavoidable in the construction of the roadway.

Agency Modified Alternative

None of the AMA proposed mitigations would eliminate the need for cut and fill or the location or dimensions of the area of disturbance; therefore, the unavoidable impacts to soils resources would be the same under this alternative as for the Proposed Action.

4.3.3 Ground and Surface Water Resources

No Action

There would be no unavoidable adverse impacts to Squirrel, Dry, Youngs, and Little Youngs Creeks under the No Action Alternative because disturbance of these resources would not occur, as described in Section 3.4.3.

Proposed Action Alternative
As proposed, some impacts to water resources are unavoidable, because streams must be crossed in order to achieve the project objective. The need for cut and fill, and subsequent reclamation of the cuts with a mixture of excavated material, have the potential to unavoidably change physical, biological and chemical aspects of the surface water and shallow groundwater systems as described in Section 3.4.3. Additionally, although mitigations and BMPs are proposed, some changes to channel hydraulics at and near stream crossings will necessarily occur when natural channels are replaced by culverts. However, MSUMRA requires that ground and surface water be reclaimed to their prior hydrologic function, and this project would be subject to MSURA regulation (**Table 3.7-1**), as well as Clean Water Act stormwater permits and DEQ Section 401 water quality certification conditions which serve to protect and restore water quality.

Agency Modified Alternative
All other aspects of the AMA will be generally similar to the Proposed Action Alternative. Therefore, other unavoidable adverse impacts will be similar to those described for the Proposed Action Alternative.

4.3.4 Vegetation and Wetlands

No Action Alternative
There would be no unavoidable adverse impacts to vegetation under the No Action Alternative as there would be minimal effects to vegetation in the absence of the AM5 corridor being developed as described in Sections 3.5.3 and 4.1.4.

Proposed Action
To construct the roadway, hundreds of acres of relatively undisturbed land would be cleared and repurposed. The information in the AM5 permit amendment estimates that approximately 970 acres would be disturbed to varying degrees during construction (**Table 3.5-4**). Approximately 300 of those acres would become part of the road surface and associated berms and service areas. SCM could reduce the overall adverse impacts to vegetation by minimizing the acres that are cleared or disturbed during construction and locating construction staging areas near the final road footprint whenever possible. MSUMRA requires that soil stockpiles and berms be reseeded soon after disturbance to reduce the potential for excess erosion of valuable topsoil and weed establishment and spread. The USACE has estimated that 5.3 acres of wetlands concentrated near Youngs Creek and a total of 4,203 linear feet of stream channel along Dry, Squirrel, Youngs and Little Youngs Creeks would be impacted as part of the road construction (USACE 2017). The 404 permit is still in process and mitigation specifics have not been finalized.

Agency Modified Alternative

None of the proposed mitigations would reduce or eliminate the need to clear lands for development of the haul road; therefore, the unavoidable adverse impacts under the AMA would be the same as those described under the Proposed Action.

4.3.5 Wildlife

No Action Alternative

Under the No Action Alternative there would be no unavoidable adverse impacts to wildlife because the AM5 permit amendment would not be approved and the impacts described under the action alternatives would not occur.

Proposed Action

Under the Proposed Action, unavoidable adverse impacts would include the loss of wildlife productivity associated with direct habitat loss, habitat fragmentation and avoidance of the area, and effects of noise during the life of the project. The permanent habitat loss of the sandstone outcrops and clay cliff faces would be unavoidable.

Greater Sage-Grouse

The loss of 970 total acres of native vegetation, including approximately 750 acres of greater sage-grouse habitat, as determined by MFWP (MDNRC 2014), would result from the construction of the haul road. This loss is unavoidable as it is necessary for the function of the road.

Agency Modified Alternative

The Agency Modified Alternative would not eliminate all effects to wildlife. The area and arrangement of disturbance under the AMA are unchanged from the Proposed Action. Therefore, the unavoidable impacts described for the Proposed Action related to direct habitat loss and avoidance would be unchanged.

Unavoidable adverse impacts to greater sage-grouse would be similar to those described for the Proposed Action because the mitigations proposed would not reduce the overall acreage of disturbance. Some mitigations, such as timing of disturbance, noise levels during construction, and off-sire mitigations such as conifer removal and grazing management practices would be beneficial.

4.3.6 Aquatics

No Action Alternative

There would be no unavoidable adverse impacts to aquatic resources under the No Action Alternative because disturbance of these resources would not occur, as described in Sections 3.7.3.

Proposed Action Alternative

As proposed, some impacts to aquatic resources are unavoidable, because the streams must be crossed in order to achieve the project objective. Filling the valley bottoms, installing the culverts, and subsequent reclamation of the stream channels, have the potential to unavoidably change physical and chemical aspects of the surface water and aquatic habitat as described in Section 3.7.3. Additionally, although mitigations and BMPs are proposed, the potential changes to channel hydraulics at and near stream crossings described in Section 3.7.3 will necessarily occur when natural channels are replaced by culverts. The straight channel required by the culverts proposed will alter the flow rate of the streams when water is present and may result in upstream headcutting or downstream erosion, particularly during spring flows. The intermittent nature of these streams may lessen the potential for erosion, but monitoring will be essential to manage these culverts for the life of the project.

Agency Modified Alternative

Unavoidable adverse impacts will be similar to those described for the Proposed Action Alternative.

4.3.7 Cultural Resources

No Action Alternative

The No Action Alternative would not create unavoidable adverse impacts to historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

Proposed Action Alternative

The Proposed Action Alternative would not create unavoidable adverse impacts to historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

Agency Modified Alternative

The Agency Modified Alternative would not create unavoidable adverse impacts to historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

4.3.8 Socioeconomics

No unavoidable adverse impacts related to socioeconomics are anticipated for any of the alternatives.

4.3.9 Transportation and Public Safety

No unavoidable adverse impacts related to transportation and public safety are anticipated for any of the alternatives.

4.3.10 Land Use

No Action Alternative

With the No Action Alternative, land use in the area would essentially remain unchanged. Therefore, there would be no unavoidable adverse land use impacts without the construction, coal hauling, or reclamation activities within the proposed AM5 corridor.

Proposed Action Alternative

To construct the haul road, grazing land, Prime Farm land if Irrigated and Farmland of statewide importance would be cleared and repurposed.

As proposed, some impacts to land use in the area would be unavoidable. To construct the roadway, hundreds of acres will be disturbed until the reclamation phase of the project has been completed. Although stockpiling of top soil is proposed for reuse during reclamation, the loss of the use of the land as farmland will be unavoidable during the construction and operation of the haul road.

Agency Modified Alternative

None of the AMA proposed mitigations would eliminate the dimensions of the area of disturbance; therefore, the unavoidable impacts to land use resources would be the same under this alternative as for the Proposed Action.

4.3.11 Visual Resources

No Action Alternative

No unavoidable adverse impacts to visual resources would occur under the No Action Alternative.

Proposed Action Alternative

The unavoidable adverse impacts due to the Proposed Action Alternative would consist of:

- While constructing, operating, and reclaiming, the construction of machine-made earthforms and haul road transecting an existing native and pastoral landscape.
- The introduction of certain amounts of dust that would be visible in the views of the landscape.
- The AM5 area post reclamation would contain scarring from construction, operation, and reclamation of the proposed haul road and ancillary improvements.
- The AM5 area corridor and the local night sky would be impacted adversely by lighting sources, both fixed and mobile, required by construction, operation, and reclamation of the corridor.

Agency Modified Alternative

The Agency Modified Alternative will be generally similar to the Proposed Action Alternative in terms of its effects to visual resources. Therefore, unavoidable adverse impacts will be similar to those described for the Proposed Action Alternative. If lighting can be planned for the minimum brightness necessary for worker safety consistent with MSHA, then changes to night sky conditions would be reduced.

4.3.12 Noise

No Action Alternative

With the No Action Alternative, noise levels in the area would essentially remain unchanged. Therefore, there would be no unavoidable adverse noise impacts without the construction, coal hauling, or reclamation activities within the proposed AM5 corridor.

Proposed Action Alternative

The construction, hauling, and reclamation activities would increase the ambient noise levels in the area, creating unavoidable adverse impacts listed in **Tables 3.13.-6, 3.13-7 and 3.13-8**.

Agency Modified Alternative

The construction, hauling, and reclamation activities would increase the ambient noise levels in the area. The proposed AMA mitigations listed in **Table 2.4-1** would reduce, but not eliminate, the noise of the construction or reclamation activities when operating. Therefore, the unavoidable adverse noise impacts under the AMA would be slightly reduced as compared to those described under the Proposed Action if noise mitigations are implemented.

4.3.13 Air Quality

No Action

There would be no unavoidable adverse impacts to air quality under the No Action Alternative because none of the dust-generating actions would occur.

Proposed Action Alternative

To construct the roadway, fugitive dust would be generated in the local area from construction and operational activities and deposited along the AM5 corridor. SCM would employ dust control procedures, but however minor, some impacts from fugitive dust would be unavoidable from the construction and operation of the roadway.

Agency Modified Alternative

The Agency Modified Alternative will be generally similar to the Proposed Action Alternative in terms of its effects to air quality. Therefore, unavoidable adverse impacts will be similar to those described for the Proposed Action Alternative.

4.4 Irreversible and Irretrievable Commitment of Resources

An irreversible or irretrievable commitment of resources refers to impacts on or losses to resources that cannot be recovered or reversed. Examples include permanent conversion of wetlands, loss of agricultural production, or socioeconomic conditions. The term "irreversible" describes the loss of future options. It applies usually to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods. As an example, once coal is mined from a deposit, it cannot be replaced.

Irretrievable is a term that applies to loss of production, harvest, or use of natural resources. As an example, grazing lands taken out of production while the land is used for a different purpose are lost irretrievably even if only temporarily. The production lost is irretrievable, but the action is not irreversible if the lands can be returned to their prior use.

4.4.1 Geology and Minerals

No Action Alternative

There will be no direct irretrievable commitment of mineral resources under the No Action alternative because there will be no disruption of the AM5 area as described in Section 3.2.3.

Proposed Action

Some geologic resources, particularly coal and aggregate, will be excavated and moved during cut and fill operations. However, as noted in Section 3.2.2.5, the coal that may be affected is not considered an economically extractable resource and the aggregate is not a unique resource in the area.

Agency Modified Alternative

None of the proposed mitigations would eliminate the need for cut and fill; therefore, irreversible and irretrievable commitment of resources would be the same under this alternative as for the Proposed Action.

4.4.2 Soils and Reclamation

No Action Alternative

There will be no direct irretrievable commitment of soil resources under the No Action alternative because there will be no disruption of the AM5 area as described in Section 3.2.3.

Proposed Action

To construct the roadway, hundreds of acres of soils will be disturbed and displaced until the reclamation phase of the project has been completed. However minor, some soils will be irreversibly displaced or removed from the area due to wind and water erosion during the construction, operation, and reclamation phases.

Agency Modified Alternative

None of the proposed mitigations would eliminate the need for cut and fill; therefore, irreversible and irretrievable commitment of soil resources would be the same under this alternative as for the Proposed Action.

4.4.3 Ground and Surface Water Resources

No Action Alternative

There will be no direct irretrievable commitment of water resources under the No Action Alternative because there will be no disruption to water resources in the AM5 area as described in Section 3.4.3.

Proposed Action

There will be no direct irretrievable commitment of water resources under the Proposed Action Alternative. Although the Proposed Action Alternative may impact water resources as described in Section 3.4.3, these impacts would primarily occur during construction and operation of the haul road, reclamation of the haul road, and would cease once the haul road is removed. Therefore, they will not involve irreversible or irretrievable commitment of resources.

Agency Modified Alternative

Proposed mitigations in the Agency Modified Alternative do not address aspects of the project that would differentiate this alternative from the Proposed Action Alternative with respect to irretrievable or irreversible commitment of water resources.

4.4.4 Vegetation and Wetlands

Irreversible Impacts

There would be no irreversible impacts to vegetation or wetlands from the No Action, Proposed Action, or the AMA. Although substantial acreage would be disturbed for the entire period of operation, reclamation plans and past vegetation reclamation success on SCM property suggest that vegetation communities would be able to be re-established. Shrublands and wetlands may take longer to become fully mature and functional, but there is no reason to expect problems with complete ecosystem function restoration. Seed mixes and plantings will need to be modeled after the native communities recorded in Scow (2017) to ensure that native species assemblages are retained.

Irretrievable Impacts

There would be no irretrievable impacts to vegetation or wetlands from the No Action Alternative. The irretrievable impacts due to the Proposed Action and the AMA would be identical because none of the mitigations would reduce or remove any acres from the proposed disturbance area or road footprint, which would be the focus of the loss of production and habitat value. The following describes the irretrievable impacts from the Proposed Action and the AMA on shrublands, grasslands, and wetlands.

Shrublands

The vegetation communities and the wildlife habitat and grazing resources they constitute would be irretrievably lost while the haul road is operating. Shrublands, which are valued as high-quality habitat for several species including greater sage-grouse, cover 568 acres within the area of disturbance and 165 of these acres would be covered by the roadway footprint. Because of the longer regeneration time for big sagebrush, the keystone plant species in the shrubland community, any acreage cleared during construction is likely to be irretrievably lost for the duration of the project.

Grasslands

Approximately 150 acres of native grassland and tame pasture would be affected by the construction of the road and 48 of these acres would be covered by the road footprint and thus irretrievably lost for the duration of the project (**Table 3.5-4**). Grasslands regenerate much faster than shrublands and any acreage reclaimed prior to operation (lands outside of the road footprint) would likely be fully functional in one to two growing seasons.

Wetlands

The USACE has estimated that 5.3 acres of wetlands concentrated near Youngs Creek and a total of 4,203 linear feet of stream channel along Dry, Squirrel, Youngs and Little Youngs Creeks would be impacted (USACE 2017). These areas would be irretrievably lost for the duration of the project and until the vegetation and hydrology are reclaimed. Wetland vegetation communities would regenerate relatively quickly while the wetland soil characteristics may take longer to fully re-establish. The 404 permit is in process and mitigation and compensation specifics have not been finalized.

Agency Modified Alternative

None of the proposed mitigations would reduce or eliminate the need to clear lands for development of the haul road; therefore, the irretrievable impacts under the AMA would be the same as those described under the Proposed Action.

4.4.5 Wildlife

No Action Alternative

Under the No Action Alternative there would be no irreversible or irretrievable commitment of wildlife resources because the AM5 permit amendment would not be approved and the impacts described under the action alternatives would not occur.

Proposed Action

Under the Proposed Action the permanent habitat loss of the sandstone outcrops and clay cliff faces would be irreversible. Irretrievable impacts to wildlife from the Proposed Action include habitat fragmentation during the life of the project and loss of disturbed habitat until the landscape is reclaimed.

Greater Sage-Grouse

Irretrievable impacts to greater sage-grouse from the Proposed Action include habitat fragmentation during the life of the project and loss of disturbed habitat until the landscape is reclaimed. As a result of habitat loss and fragmentation, greater sage-grouse may experience accelerated long-term population declines within the AM5 project area and surrounding area. The disturbance and fragmentation may result in extirpating the local greater sage-grouse population. When the AM5 project area is fully reclaimed, it would be possible for greater sage-grouse populations to recolonize this habitat.

There are potential scenarios where irreversible impacts may result from the action alternatives. If greater sage-grouse were no longer present in the surrounding area after reclamation preventing recolonization of the AM5 area, then the impact might be considered irreversible. If the population of greater sage-grouse in the AM5 area was genetically distinct from other greater sage-grouse populations and disturbance associated with the Proposed Action caused a local extinction of that population then the impact might be considered irreversible. Both of these irreversible impact scenarios are unlikely.

Agency-Modified Alternative

Under the Agency-Modified Alternative, irreversible and irretrievable impacts would be similar to those described for the Proposed Action.

4.4.6 Aquatics

No Action Alternative

Under the No Action Alternative, there would be no irreversible or irretrievable commitment of aquatic resources because the AM5 haul road would not be constructed and the impacts described under the action alternatives would not occur.

Proposed Action

The culverts placed at the four major stream crossings would replace natural stream channels as described in Section 3.7.3. The aquatic communities and the riparian and stream habitat covered by these culverts and the associated disturbance would be irretrievably lost while the haul road is operating. Even though water would flow unimpeded through these culverts, the channel inside the culvert is not analogous to a functioning stream and would not support fish, aquatic invertebrates, or plants. The culvert reaches are unlikely to damage any living organisms that might pass through them, but these segments would not contribute to the aquatic health of the area. Reclamation would be expected to restore the stream function and associated habitat; therefore, these impacts would not be considered irreversible.

Agency Modified Alternative

None of the proposed mitigations would reduce or eliminate the need to place culverts at the four major stream crossings as part of the development of the haul road; therefore, the irretrievable impacts under the AMA would be the same as those described under the Proposed Action.

4.4.7 Cultural Resources

No Action Alternative

The No Action Alternative would not lead to an irreversible and irretrievable commitment of historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

Proposed Action Alternative

The Proposed Action would not lead to an irreversible and irretrievable commitment of historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

Agency Modified Alternative

The Agency Modified Alternative would not lead to an irreversible and irretrievable commitment of historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

4.4.8 Socioeconomics

No irreversible or irretrievable commitment of resources related to socioeconomics are anticipated for any of the alternatives.

4.4.9 Transportation and Public Safety

No irreversible or irretrievable commitment of resources related to transportation and public safety are anticipated for any of the alternatives.

4.4.10 Land Use

Proposed Action

To construct the haul road, grazing land, Prime Farmland if Irrigated, and Farmland of Statewide Importance would be reduced and taken out of production while the haul road is constructed and in use.

Within the disturbance area, 58.5 acres of prime farmland will be disturbed for the construction of the haul road. Soils from prime farmland areas will be stored separately of non-prime farmland soils and respread during the reclamation phase. Crop production will be reduced during the reclamation phase until regeneration of vegetation occurs.

4.4.11 Visual Resources

Irreversible Impacts

There would be no irreversible impacts to visual resources from the No Action, Proposed Action, or the AMA. Although substantial acreage would be disturbed and the topography would be altered for the entire period of operation, reclamation plans and recontouring would be able to be re-establish the visual conditions such that the effects of the project would not be distinguishable in the long-term. A landform sensitive regraded corridor would bear only moderate scaring at primary cut, fill borrow, and retention pond sites.

Irretrievable Impacts

There would be no irretrievable impacts to visual resources from the No Action Alternative. The irretrievable impacts due to the Proposed Action and the AMA would be identical because none of the mitigations would reduce or change any of the planned landscape alterations from the proposed disturbance area or road footprint, which would be the focus of the changes to the viewshed.

4.4.12 Noise

No Action Alternative

With the No Action Alternative, noise levels would essentially remain unchanged. Therefore, there would be no irreversible or irretrievable loss of resources without the construction, coal hauling, or reclamation activities within the proposed AM5 corridor.

Proposed Action

Construction and reclamation activities would cause short-term noise impacts. Construction and reclamation L_{dn} noise levels are predicted to exceed the EPA day-night L_{dn} 55 dBA guideline (EPA 1978) at the closest residential receptor R1 (**Table 3.13-**

6), located approximately 0.35 mile west of the haul road. The L_{50} noise levels from the construction and reclamation activities are predicted to exceed the EO stipulation L_{50} +10 dBA above baseline noise at 10 greater sage-grouse leks (**Table 3.13-8**) located adjacent to the AM5 corridor. Therefore, the construction and reclamation activities are predicted to result in an irretrievable noise impacts to nearby humans and wildlife.

The long-term haul truck operations will also change the acoustical environment until the road is reclaimed at the conclusion of the permitted activities. However, the haul truck operations are not predicted to exceed the EO stipulation L_{50} +10 dBA above baseline at the nearby leks.

Agency Modified Alternative

The construction, hauling and reclamation activities would increase the ambient noise levels in the area. The proposed AMA mitigations listed in **Table 4.1-1** would reduce some of the noise of the Project activities, but not completely eliminate the noise, thereby changing the acoustical environment.

4.4.13 Air Quality

No irreversible or irretrievable commitment of resources related to air quality are anticipated for the No Action Alternative. Actions that would contribute to fugitive dust are not mitigated under the AMA; therefore impacts would be identical to those under the Proposed Action. To construct the roadway, fugitive dust will be generated in the local area from construction and operational activities and deposited along the AM5 corridor. However minor, the deposition of fugitive dust would be irreversible.

4.5 Secondary Impacts

Secondary impacts to the human environment are indirectly related to the agency action, i.e., they are induced by a primary impact and occur at a later time or distance from the triggering action. For example, a possible secondary impact of establishing settling ponds to capture surface runoff water from the road would be changes in vegetation down gradient from the ponds due to increased seepage.

4.5.1 Geology and Minerals

No Action Alternative

Under the No Action Alternative, there is potential for limited secondary impacts to mineral development in the AM5 area, but no secondary impacts to geology are anticipated. Specifically, with no large-scale cut and fill activities occurring, geologic material in the AM5 area would be left in place, leaving the appearance, physical characteristics, and geochemistry of the AM5 area unchanged from its present condition. However, in the absence of a transportation corridor bisecting the AM5 area, it may be more likely that development of the coal-bed methane resource in the AM5 area would re-start if natural gas market conditions improve.

Proposed Action Alternative

No secondary impacts to geology and minerals are anticipated because the area of disturbed geology will be confined to the extent of cut and fill activities. Due to the limited extent of this disturbed area, impacts associated with the Proposed Action Alternative are all expected to be primary impacts (See Section 3.2.3).

Agency Modified Alternative

With respect to geology and minerals, the Agency Modified Alternative is indistinguishable from the Proposed Action.

4.5.2 Soils and Reclamation

No Action Alternative

Under the No Action Alternative, the AM5 haul road would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Montana-Wyoming border to the SCM. With the No Action Alternative, the lack of road development, use, and reclamation would result in the soils remaining as described in the existing condition above. No secondary effects to soils would occur with the No Action Alternative.

Proposed Action Alternative

Secondary impacts from the Proposed Action would result from a slight increase in sediment loading, which leads to the deposition of sediments on water, soil, vegetation, and impacts to unique, endangered, fragile, or limited environmental resources, terrestrial and aquatic life. Overall, any secondary impacts to the physical and biological aspects of the human environment as a result of the Proposed Action are expected to be local and minor because of the requirements under the MWQA and MSUMRA that require the use of sediment control BMPs and the restoration of premine topography and vegetation.

Agency Modified Alternative

Several mitigations could affect the secondary effects of soils and reclamation as noted. Keeping construction equipment out of wetland, riparian, and saturated areas, timing construction activities when the ground is frozen, and constructing or removing culverts during low or no flow periods would reduce erosion of the soil and subsequent sediment transport. The proposed mitigations would result in only a slight reduction in sediment loading in comparison to the Proposed Action; therefore, the secondary impacts under the AMA would be slightly less than those described under the Proposed Action.

4.5.3 Ground and Surface Water Resources

No Action Alternative

In the absence of a transportation corridor bisecting the AM5 area, the area may be more likely to be developed for the coal-bed methane resource in the future if natural gas market conditions improve. This type of development could slow or stop groundwater level recovery trends in surrounding coal aquifers and may lead to additional drawdown in these aquifers.

Proposed Action Alternative

Under the Proposed Action Alternative, primary impacts included the potential to change flow rates and patterns in streams due to a reduction in agricultural flood irrigation in some areas, which could lead to secondary impacts. Resulting changes in the rate and timing of streamflow could indirectly have a marginal effect on wildlife and aquatic species that utilize the streams for habitat, resulting in secondary impacts. Potential changes in groundwater recharge patterns and chemistry during operation and post-reclamation could also indirectly affect surface water chemistry in locations where streams receive groundwater discharge. Changes to surface water chemistry may lead to altered downstream water quality, which could also affect wildlife and aquatic species.

Additionally, altered channel hydraulics resulting from culvert crossings could indirectly affect nearby upstream and downstream channel reaches. In particular, changes in gradient and stream velocity would indirectly lead to altered erosional and depositional patterns. Secondary impacts would be reduced by adherence to the required BMPs and other regulations described in **Table 3.3-1**.

Agency Modified Alternative

The AMA would have impacts similar to those described under the Proposed Action.

4.5.4 Vegetation and Wetlands

No Action Alternative

Under the No Action Alternative there would be no secondary impacts to vegetation or wetlands resources because the AM5 permit amendment would not be approved and the impacts described under the action alternatives would not occur. The Thunder Basin CI/CP includes removal of over 800 acres of conifers within the AM5 permit boundary. This mitigation would encourage re-establishment of sagebrush or grassland vegetation favored by greater sage-grouse and other prairie species (**Table 2.2-1**).

Proposed Action Alternative

The focused nature of the haul road disturbance would likely limit primary impacts to the immediate area along and beside the proposed roadway. The impacts of changes in the vegetation community alongside the roadway and in the revegetated slopes would potentially affect the species composition of adjacent lands as seeds are dispersed. The seed mix used for revegetation would be developed to mimic local and native plant community composition to limit changes. The potential for weed spread would be increased due to the surface disturbance. Consistent implementation of the weed control plan should minimize weed establishment. However, the duration of the impacts and the time it would take the vegetation communities to become re-established after the roadway is removed would be the source of most of the secondary impacts. If cattle grazing practices are altered because of the AM5 haul road, grazed vegetation patterns could change over time.

Shrublands

As noted in the primary impacts and cumulative impacts sections, sagebrush is a perennial, woody shrub that takes several years to mature. In addition, its re-establishment has proven challenging for land reclamation (Shuman and Richmond 2000) although SCM has demonstrated the ability to reclaim shrub stands to pre-mine conditions in 10 years. The impacts from surface disturbance and clearing of shrubland habitat would be noticeable for many years after the project is completed as the vegetation community regrows and becomes re-established. Areas covered by the road and associated fill and berms would not be re-established until several years after the road is removed and reclamation and revegetation actions are completed. Therefore, the impacts to shrublands are likely to be long term and potentially substantial. Young sagebrush attracts browsing species and may provide good forage which can attract wildlife and further hinder shrub re-establishment, especially when this food source has been reduced due to clearing; however, SCM has not experienced problems with this during past reclamation revegetation (Schuman et al. 2010).

Pine Juniper Savannah and Conifer Breaks

SCM has agreed to remove conifers where their encroachment has replaced sagebrush or productive grasslands. The long-term effect of conifer removal may benefit wildlife if the areas successfully establishes sagebrush. Although conifer species are native to the area in and around SCM, the expansion of conifers beyond their historic acreage in native prairie habitats can have negative impacts in terms of wildlife habitat quality and fire regime changes. The 800 acres of conifer removal that are part of the Thunder Basin CI/CP would occur in addition to other conifer removals resulting from the development of the AM5 haul road. The benefits of these removals would likely be delayed until after reclamation is completed and the sagebrush is able to mature and become established.

Wetlands

The haul road would be elevated above the current valley bottoms where it crosses streams. The depth of fill in these valleys would be substantial, ranging from 30 feet in the Youngs and Little Young Creeks crossings to over 90 feet at the Dry Creek crossing. The weight of the fill and haul trucks have the potential to compact the soils and likely limit some subsurface drainage even with proposed geotextile engineering to limit compaction. This may create wetter areas uphill of the road structure. It is not uncommon for wetlands to develop in upgradient areas along roadways as a result of the longer period of soil saturation on the upstream side of a roadway. Vegetation may change over the life of the project, even if the soils do not have time to acquire hydric characteristics. After reclamation, the vegetative community would return to preproject conditions.

Agency Modified Alternative

Proposed mitigations in the Agency Modified Alternative that may alter the potential secondary impacts to vegetation resources include the funneling of runoff to ponds. The increase in local water availability may lead to more mesic adapted species growing in and downhill of these areas. Mesic vegetation may provide cover for some wildlife species. Decommissioning roads and reseeding these areas would also increase the overall vegetated acreage in the AM5 area, potentially reduce weed spread, and increase the habitat value of the reseeded areas. The remainder of the mitigations proposed would not directly affect vegetation resources; therefore, the AMA would have substantially the same secondary impacts on vegetation as the Proposed Action Alternative.

4.5.5 Wildlife

No Action Alternative

Under the No Action Alternative there would be no secondary impacts to wildlife resources because the AM5 permit amendment would not be approved and the impacts described under the action alternatives would not occur.

Greater Sage-Grouse

The AM5 would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Youngs Creek mine in Wyoming to the SCM. With the No Action Alternative, the lack of road development, use, and reclamation would result in the greater sage-grouse habitat associated with the AM5 project not being altered. The Thunder Basin CI/CP would provide some habitat improvements including removal of over 800 acres of conifers within the AM5 permit boundary (Section 4.5.4). These actions would encourage re-establishment of sagebrush or grassland vegetation favored by greater sage-grouse and other prairie species (**Table 2.2-1**). Related future actions (Section 4.1) may still go forward, regardless of the AM5 project. Implementation of these future actions, including substantial surface disturbances, would result in further habitat fragmentation and an associated habitat loss in local greater sage-grouse populations.

Proposed Action

Under the Proposed Action, a secondary impact to wildlife would be linked to avoidance of the AM5 area due to noise and human activity. Avoidance, combined with habitat fragmentation and habitat loss would result in a reduced carrying capacity of the permit area for all wildlife species. Wildlife such as big game and raptors in areas adjacent to the AM5 area would likely be subject to increased competition with displaced animals, and would thus be adversely affected.

The effect of noise on wildlife would also be a secondary impact of the Proposed Action. Noise during construction and operation may disrupt behavior and mask important signals causing compromised physiological function, diversion of time and energy, failure to detect important cues, impaired acoustical advertisement and communication, and reduced utilization of important habitats or resources. All of these costs have consequences for individual fitness and survival (Hatch and Fistrup 2009).

The Proposed Action may decrease population abundance or density of breeding individuals in habitats adjacent to the road (DOT-FHWA 2011; NCHRP 2008). Population effects have been documented frequently among bird species in the vicinity of linear developments (Jalkotsy et al. 1997). Reduced landscape connectivity and limited movements due to the Proposed Action may result in higher wildlife mortality, lower reproduction rates, ultimately smaller populations and overall lower population viability. Loss of connectivity may take several generations to manifest (DOT-FHWA 2011), but could still occur during the life of the project for many species.

Post reclamation, changed topography, loss of habitat features (e.g., cliffs and rock outcrops) and changed vegetative cover (e.g., reduction in shrub density and loss of trees) would cause a decrease in carrying capacity and diversity in the permit area. Shrubs and trees would gradually become re-established on the reclaimed land, but the topographic changes would be permanent.

Greater Sage-Grouse

Secondary impacts to greater sage-grouse may include increased competition for resources in the surrounding area, increased use of marginal habitat, and accelerated local population declines. Habitat fragmentation will likely result in the long term loss of local populations. The AM5 haul road and all of the activity and noise associated with the construction and could create a physical barrier that greater sage-grouse will not move through. The intact and contiguous habitat east of the haul road, including potential brood habitat may be avoided, as the block of suitable habitat may fall below the generally accepted threshold of 10,000 acres minimum patch size. As disturbed areas are avoided, greater sage-grouse may use similar surrounding habitat resulting in increased competition or attempt to utilize lesser quality habitats, resulting in higher mortality.

Agency-Modified Alternative

Under the Agency-Modified Alternative, secondary impacts would be similar to those described for the Proposed Action. However, the mitigation measures designed to reduce noise levels would reduce secondary impacts to wildlife over those described for the Proposed Action. It is difficult to know if wildlife would use the bottomless arch culverts as passage conduits because of their length. A 300-foot long culvert is likely to appear as a dark cave rather than a possible passage. Reviews of current literature did not yield studies of wildlife use of similar sized structures.

Greater Sage-Grouse

Even with the AMA components, secondary impacts will still be substantial. If SCM shuts down operations on the AM5 corridor during the breeding and nesting season (March 1 through July 15) it is anticipated that this might reduce perturbations in greater sage-grouse behavior, but it is unknown how effective this mitigation would be. The size of the haul road, coupled with the height, may be such that greater sage-grouse may not cross even during periods of no activity. If the light poles are installed, it is anticipated greater sage-grouse will further avoid this area and predation risk would be elevated for birds remaining. The habitat available east of the haul road may no longer be of sufficient size to support a viable population once the roadway is in place. Continued monitoring will be essential to assessing the efficacy of the mitigations prescribed. Mitigation measure outside of the AM5 footprint, such as livestock grazing management and conifer removal may reduce some of the secondary impacts to greater sage-grouse over those described for the Proposed Action.

4.5.6 Aquatics

No Action Alternative

Under the No Action Alternative there would be no secondary impacts to aquatic resources because the AM5 permit amendment would not be approved and the impacts described under the action alternatives would not occur.

Proposed Action Alternative

Under the Proposed Action Alternative, primary impacts included the potential to change flow rates and patterns in streams due to the culverts and disturbance of the stream channels and riparian habitats. Resulting changes in streamflow could indirectly have a marginal effect on aquatic species that use the streams for habitat, resulting in secondary impacts. If fish are unable to negotiate the culverts, discontinuity in their populations would result and reproduction success may be reduced, especially upstream of the culverts in the perennial streams. Other secondary effects to water chemistry discussed in Section 4.5.3 would also have the potential to affect fish and macroinvertebrate populations downstream.

Additionally, altered channel hydraulics and sediment transport resulting from culvert crossings could indirectly affect nearby downstream channel reaches. In particular, changes in gradient and stream velocity may indirectly lead to altered erosional and depositional patterns. Once reclamation is completed, these impacts are expected to dissipate and no lasting negative secondary impacts would be expected.

Agency Modified Alternative

The Agency Modified Alternative would have secondary impacts similar to those discussed under the Proposed Action Alternative.

4.5.7 Cultural Resources

No Action Alternative

The No Action Alternative will not create secondary impacts to known historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

Proposed Action Alternative

The Proposed Action will not create secondary impacts to known historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

Agency Modified Alternative

The Agency Modified Alternative will not create secondary impacts to known historical properties because there are no significant cultural resources within the AM5 area that warrant further protection.

4.5.8 Socioeconomics

No secondary impacts to socioeconomics are anticipated for any of the alternatives because the number of new jobs created is expected to be minimal in the context of overall employment in Big Horn County. The number and duration of any new jobs or new families added to the ROI would not be substantial enough to have long-term effects to the economy or services required.

4.5.9 Transportation and Public Safety

No secondary impacts to transportation and public safety are anticipated for any of the alternatives because even the primary impacts identified are expected to be minimal. Due to limited conflict with existing roadways, impacts associated with the proposed action alternative are all expected to be primary impacts and no impacts were identified for the No Action Alternative or the Agency-Mitigated Alternative (see Section 3.10.3).

4.5.10 Land Use

No Action Alternative

The No Action Alternative will not create secondary impacts to land use because land use would remain unchanged.

Proposed Action Alternative

The Proposed Action would create minor secondary impacts to land use patterns because cattle movement would be restricted by the AM5 corridor. This may affect how cattle and wildlife are dispersed across the permit area.

Agency Modified Alternative

The Agency Modified Alternative addresses the cattle grazing lease on the permit area and could have beneficial secondary impacts to range condition and other resources used by cattle and wildlife. The AMA would not have substantial effects to how land is used outside of the immediate disturbance area.

Overall, any secondary impacts to the physical and biological aspects of the human environment as a result of any of the alternatives are expected to be local and minor.

4.5.11 Visual Resources

No Action Alternative

The No Action Alternative will not create secondary impacts to visual resources because land use would remain unchanged.

Proposed Action Alternative

Secondary impacts to visual resources due to the Proposed Action would include changes in patterns of animal use and movement brought about by the proposed AM5 haul road that may change the landscape level vegetation pattern in and adjacent to the proposed corridor. Changes would result from livestock grazing rotation, stocking patters and intensity, including paths to water gaps and gates. The AM5 haul road construction, operation, and reclamation may introduce non-native and noxious plants to the AM5 corridor and adjacent landscape. During construction and reclamation conifer, cheatgrass, and non-native plant management would affect a change to a more native landscape vegetation. This change could create a visual contrast with the adjacent non-managed landscape. This contrast would change seasonally. Higher contrast would likely occur in the spring and fall. Overall, because the AM5 area is removed from publicly accessible viewpoints, any secondary impacts to the physical aspects of the visual resource of the Proposed Action Alternative are expected to be local and minor.

Agency Modified Alternative

As noted in the previous section, the Agency Modified Alternative addresses the cattle grazing lease on the permit area and could have beneficial secondary impacts to range condition which would affect the visual character of the AM5 area. However, the limited visible accessibility of the area due to its remoteness would minimize these impacts.

4.5.12 Noise

No Action Alternative

With the No Action Alternative, noise levels would essentially remain unchanged. Therefore, there would be no secondary impacts without the construction, coal hauling, or reclamation activities within the proposed AM5 corridor.

Proposed Action

Secondary impacts on humans due to intruding noise include annoyance. Indirect effects include stress reactions, sleep interference, efficiency reduction and fatigue (Harris 1998). Construction and reclamation noise is estimated to be clearly audible at the two residences located within 1.5 miles of the haul road. The hauling operations are also predicted to be clearly audible at the closest residence (R1) and occasionally audible at residential receptor R2, when trucks pass-by on the roadway (**Table 3.13-7**). The increased noise levels may cause negative reactions from the residents, especially during nighttime hours.

Although some animals habituate to new noise sources (e.g., big game species), secondary impacts to wildlife occur when noise interferes with auditory signals such as breeding (e.g., greater sage-grouse) or communication (e.g., raptors and songbirds) causing displacement and/or nest abandonment.

Agency Modified Alternative

The proposed AMA noise mitigations would reduce, but not eliminate the construction, operation and reclamation noise, and therefore, secondary impacts may still exist. However, noise level measurements during phases of the AM5 project may demonstrate that Project noise levels are mitigated to 10 dBA or less increase above existing ambient conditions, to reduce wildlife noise impacts (**Figure 3.13-2** and **Figure 3.13-3**). The secondary impacts of the AMA would be similar to the Proposed Action. Strategically placing the berms near sensitive areas could reduce secondary impacts to those areas (**Figures 3.12-2** and **3.12-3**).

4.5.13 Air Quality

No Action Alternative

Under the No Action Alternative, the AM5 would not be developed or reclaimed, no mine related traffic would occur, and no coal would be hauled from the Montana-Wyoming border to the SCM. With the No Action Alternative, air quality would remain essentially unchanged and would not be indirectly affected by ore hauling or other mine-related road development, traffic, or reclamation activities.

Proposed Action Alternative

Secondary impacts from the Proposed Action would result in a slight increase of fugitive dust emissions in the area, which leads to the deposition of that pollutant on water, soil, vegetation, and impacts to unique, endangered, fragile, or limited environmental resources, terrestrial, and aquatic life. Overall, any secondary impacts to the physical and biological aspects of the human environment as a result of the Proposed Action are expected to be local and minor.

Agency Modified Alternative

None of the proposed mitigations would significantly reduce or eliminate the slight increase in fugitive dust emissions in the area; therefore, the secondary impacts under the AMA would be the same as those described under the Proposed Action.

4.6 Regulatory Restrictions

On December 30, 2015, Cloud Peak Energy (CPE) submitted Amendment Application AM5 for SCM Surface Mining Permit C1979012, seeking to amend its surface coal mining permit to allow for the construction and operation of a haul road extending south of the existing SCM permit boundary to the Wyoming border. AM5 would add approximately 4,334 acres to the approved permit area for the purpose of a transportation corridor south of the existing permit boundary. The transportation corridor would provide a means to move coal from the YCM in Wyoming to the SCM for processing.

The analysis for compliance with the Private Property Assessment Act (PPAA) is a two-step process. An initial analysis must be performed to determine whether the proposed agency action is covered under the PPAA. If that question is answered in the affirmative, an analysis must then be performed to determine whether the Proposed Action has takings implications.

The approval of SCM Amendment Application AM5 is covered under the PPAA. A state agency's decision regarding an application for a permit amendment is subject to the PPAA where the state agency either (1) denies the amendment application, or (2) approves the amendment application with a condition that has not been agreed to by the regulated entity (here, SCM) at the time of the publication of the environmental analysis.

In this case, DEQ understands that SCM has requested approval of the AM5 amendment application, but has not as of this date agreed to all conditions which DEQ would require in connection with its approval of the AM5 amendment application. Should SCM consent to all DEQ-required conditions prior to the date of publication of the environmental analysis (here, an environmental impact statement), then the AM5 Amendment would not be subject to the PPAA.

In particular, SCM has not consented to the imposition of the following mitigations which would be associated with DEQ's approval of the AM5 Amendment: (1) a limitation on construction-phase blasting to daytime hours, and (2) a requirement to have a tribal representative and/or qualified archaeologist on site during construction.

Government entities generally have the authority and responsibility to protect the public health, safety, and welfare. Under this "police power," government entities may limit the use of real property through land use planning, zoning ordinances, set back requirements, and environmental regulations. Normally, a government entity's exercise of its police powers does not involve a taking of private property. Nevertheless, at some point government regulations may go too far and constitute a taking of property.

DEQ's imposition of a limitation on construction-phase blasting to daytime hours and a requirement to have a tribal representative and/or qualified archaeologist on site during construction are necessary to achieve compliance with MSUMRA. Neither the blasting hours limitation nor the on-site archaeologist requirement would result in a permanent or indefinite physical occupation of SCM's property, deprive SCM of all economically beneficial uses of its property, deny SCM a fundamental attribute of property ownership, require SCM to dedicate a portion of its property or grant an easement, have a severe impact on the value of SCM's property, or cause physical disturbance with respect to SCM's property in excess of that sustained by the public generally. Therefore, there are no takings implications.

Chapter 5 : Comparison of Alternatives and Preferred Alternative

Tables 5.1-1, 5.1-2, and 5.1-3 summarize and compare the potential primary, secondary, and cumulative impacts on natural, cultural, and human resources associated with the alternatives. Primary impacts are described fully in Chapter 3; secondary and cumulative impacts are discussed in Chapter 4.

The rules and regulations implementing MEPA (ARM 17.4.617) require agencies to indicate a preferred alternative in the Draft EIS, if one has been identified. DEQ has identified certain aspects of the Agency Modified Alternative as the Preferred Alternative for the reasons discussed below.

During the required consultation process in MEPA, SCM has voluntarily committed to implement mitigations identified in the Agency Modified Alternative which are indicated in bolded rows in **Table 2.4-1**. These measures are now part of the Preferred Alternative to minimize project impacts to the environment.

DEQ worked closely with the Montana Sage Grouse Habitat Conservation Program (Sage Grouse Program), who implements the Executive Order No. 12-2015 for the sage grouse conservation strategy with guidance from the Montana Sage Grouse Oversight Team (MSGOT). In the initial development of the Agency Modified Alternative, DEQ and the Sage Grouse Program developed on-site mitigation measures for the project. These on-site mitigation measures are shaded green in **Table 2.4-1**. These on-site measures would not be part of the Preferred Alternative.

While conducting the environmental analysis; DEQ, the Sage Grouse Program, and SCM realized that opportunities for effective, on-site mitigations were limited. Previous anthropogenic disturbances and the cumulative impacts of potential future projects independent of the proposed haul road are already impacting the habitat for greater sage-grouse in the area. Also, any benefits of on-site mitigation would likely be negated by the project itself and the intensive nature and permit duration of the activity now being considered. Therefore, the Sage Grouse Program recommended and the MSGOT approved on April 26, 2018 a plan which includes compensatory mitigation to accomplish off-site mitigation. Plus, SCM voluntarily committed to apply this sage grouse mitigation plan as identified in **Appendix B**.

The Preferred Alternative also includes the following mitigations:

- Blasting: Limit to daytime hours and comply with the requirements of ARM 17.24.624 and 17.24.159,

- Construction Monitoring: Having a tribal representative and/or qualified archaeologist on site during construction

There are two residences that are owned and leased out by SCM. Only one of the two residences is currently occupied. During the analysis, it was identified there could be noise impacts to these residences from the construction phase of the project. The residence in T10S R38E Section 1 is occupied currently, and SCM has committed to take reasonable steps to alleviate noise impacts during the construction phase. SCM does not have any immediate plans for future occupancy of the residence in T9S R39E Section 14.

These measures would minimize noise during construction at human and wildlife receptors near the project. During construction, having a tribal representative and/or qualified archeologist present during construction could minimize disturbances to these cultural features.

DEQ has determined that all aspects of the preferred alternative are reasonable, achievable under current technology, and economically feasible (Section 75-1-201(1)(b)(vi)(C)(I), MCA). DEQ has consulted extensively with SCM regarding all aspects of the preferred alternative, has given due weight and consideration to SCM's comments to date regarding the preferred alternative, and will do so going forward in connection with the formulation of the FEIS (Section 75-1-201(1)(b)(vi)(C)(II), MCA).

5.1 Comparison of Alternatives

The following tables summarize the substantive impacts identified in Chapters 3 and 4 of the DEIS for each of the alternatives. This is meant to facilitate a comparison based on the impacts most likely to occur or those that would have the potential to affect some aspect of the human environment in a substantial way. The full discussion of all potential impacts is contained in Chapters 3 and 4 in the resource-specific subsections.

Table 5.1-1. Summary of Primary Impacts for each of the Alternatives Organized by Resource Area

Resource	No Action	Proposed Action	Agency Modified Alternative	Preferred Alternative
Geology and Minerals	No substantive impacts anticipated.	Approximately 6.5 million cubic yards of material will be removed from cuts in the AM5 area and used as fill for the haul road bed. When replaced there will be some changes to the physical and chemical nature. Some changes to bedrock and cliff faces will not be reclaimable. No impacts to mineral resources are anticipated because the quality of the coal is less than what is considered marketable.	No aspect of the AMA would reduce or alter the volume disturbed or how it would be reclaimed.	No aspect of the Preferred Alternative would reduce or alter the volume disturbed or how it would be reclaimed.
Soils and Reclamation	No substantive impacts anticipated.	Loss of up to 970 acres of land temporarily removed from the productive soil base for the duration of the project.	Non targeted mitigations related to the reduction of soil disturbances would have minor reduction of impacts to soils, but all other aspects of the Proposed Action would persist.	Primary impacts would remain the same as those described for the Proposed Action.
Surface and Groundwater	No substantive impacts anticipated.	Straightening naturally sinuous stream channels and the alteration of channel gradients may locally affect stream velocities and channel hydraulics and sediment transport equilibrium in the reaches captured by the proposed culverts. Compaction of valley bottom soils from large fill placement may impede shallow groundwater flow.	Primary impacts would remain the same as those described for the Proposed Action.	Primary impacts would remain the same as those described for the Proposed Action.
Vegetation and Wetlands	The Thunder Basin CI/CP includes removal of 800 acres of conifers and revegetating those areas with shrubland and native grassland species. No other substantive impacts anticipated in the absence of the AM5 corridor.	Loss of up to 568 acres of shrublands for the duration of the project Loss of 13.7 acres of drainage bottom (potential wetland) for the duration of the project. Increased potential for spread of noxious weeds because of widespread surface disturbance.	No aspect of the AMA would reduce or alter the acreages disturbed.	No aspect of the Preferred Alternative would reduce or alter the acreages disturbed or how they would be reclaimed
Wildlife	No substantive impacts anticipated. The Thunder Basin CI/CP includes several actions that may benefit wildlife in and around the AM5 area, but most are located outside of the permit boundary.	Habitat loss of 970 acres for the duration of the project. Permanent loss of sandstone outcrops, clay cliff faces, and other topographic features. Displacement of wildlife species using the AM5 permit area. Direct loss of some individuals due to roadkill, collisions with powerlines and fences, and destruction of habitat. Habitat fragmentation for the duration of the project which may cause reduced fitness.	Potential predation from perching raptors would be reduced if the high voltage distribution line is buried. The noise reduction aspects of the AMA would lessen overall impacts to wildlife during construction and reclamation. The SGP mitigation plan would provide compensatory mitigation at offsite areas.	Primary impacts would remain the same as those described for the Proposed Action. The SGP mitigation plan would provide compensatory mitigation at offsite areas.
Aquatics	No substantive impacts anticipated.	Loss of native stream habitat in three perennial streams (Squirrel, Youngs, and Little Youngs Creeks) and in one ephemeral stream (Dry Creek) for the life of the project. Aquatic and riparian habitat replaced by underground conveyance (culverts under road fill). Potential interruption of native fish migration both up and downstream of each culvert.	Primary impacts would remain the same as those described for the Proposed Action.	Primary impacts would remain the same as those described for the Proposed Action.

Table 5.1-1. Summary of Primary Impacts for each of the Alternatives Organized by Resource Area

Resource	No Action	Proposed Action	Agency Modified Alternative	Preferred Alternative
		Changes to upstream fish communities due to lack of connection. Shading may reduce stream temperatures locally Increased gradient my increase erosion locally.		
Cultural Resources	No substantive impacts anticipated.	No substantive impacts anticipated.	No substantive impacts anticipated.	No substantive impacts anticipated.
Socioeconomics	No substantive impacts anticipated.	Minor increase in employment opportunities. Minor impacts from the predicted 1.9 percent population increase, including impacts to schools, social services and housing	If limitations of construction hours are imposed, there would may be changes to employment as the project timeline may be extended, but there would be fewer hours to work during seasonal restrictions.	No aspect of the Preferred Alternative would alter primary impacts to socioeconomics.
Transportation and Public Safety	No substantive impacts anticipated.	Level of impact to Youngs Creek Road can be considered minimal due to low traffic volumes. Minor concerns were noted related to safety and visibility of the crossing.	Level of impact to Youngs Creek Road can still be considered minimal due to low traffic volumes. The AMA includes crossing enhancements that address the safety concerns of the proposed action alternative.	Primary impacts would remain the same as those described for the Agency Modified Alternative.
Land Use	No substantive impacts anticipated.	The haul road would cross and interrupt existing grazing lands and areas identified as Prime Farmland if Irrigated and Farmland of Statewide Importance and these areas would be taken out of production.	If fencing is incorporated along the haul road alignment, grazing lands and farmland would still be disturbed, but fencing could be used to minimize the amount of disturbance to these uses	Primary impacts would remain the same as those described for the Agency Modified Alternative.
Visual Resources	No substantive impacts anticipated.	Physical and visual modification and disruption of native landforms and vegetation pattern. All non-daylight activities would be visible, the result of mobile and stationary lighting and dust illumination. The remote location would minimize the number of people affected by these disturbances, but wildlife would be affected.	Limiting hours of construction in deference to wildlife (greater sage-grouse) would largely eliminate the impact from lighting. No aspect of AMA would materially reduce the area of disturbance.	
Noise	No substantive impacts anticipated	Construction and reclamation activities would cause short-term noise impacts, and exceed the EPA day-night L_{dn} 55 dBA guideline at the closest residential receptor (R1). The L_{50} noise levels will exceed the EO stipulation L_{50} +10 dBA above baseline noise at nine sage-grouse leks. The long-term haul truck operations will change the acoustical environment, but are not predicted to exceed the EO stipulation L_{50} +10 dBA above baseline noise at any of the sage-grouse leks evaluated.	The proposed AMA mitigations would minimize but not eliminate all the noise of the construction or reclamation equipment. It is unlikely that the AMA construction/reclamation mitigations would reduce the noise to less than 10 dBA above ambient at six leks. The proposed AMA noise operation mitigations would not eliminate all the noise. Some changes to ambient noise levels may be noticeable.	SCM has agreed to reduce noise levels at the residences particularly at night.
Air Quality	No substantive impacts anticipated	Increase in up to a maximum of 246.7 tons per year of fugitive dust (PM_{10}) occurring during the operation phase.	Non targeted mitigations related to the reduction of soil disturbances would have localized minor reductions in fugitive dust emissions from wind erosion, but all other aspects of the Proposed Action would persist.	Primary impacts would remain the same as those described for the Agency Modified Alternative.

The following table is a summary of the secondary impacts discussions in Section 4.5. Please see the resource specific subsections for more details on the rationale for these impacts.

Table 5.1-2. Summary of Secondary Impacts for each of the Alternatives Organized by Resource Area

Resource	No Action	Proposed Action	Agency Modified Alternative	Preferred Alternative
Geology and Minerals	No substantive impacts anticipated to geology in the absence of the AM5 corridor development. Coal-bed methane development may be more likely if economic conditions change.	No substantive impacts anticipated.	No aspect of the AMA would reduce or alter the acreages disturbed.	No aspect of the Preferred Alternative would reduce or alter the volume disturbed. Secondary impacts would be the same as the Proposed Action.
Soils and Reclamation	No substantive impacts anticipated.	Potential for a slight increase in sediment loading downstream. BMPs and regulatory requirements would minimize this potential.	Non-targeted mitigations related to the reduction of soil disturbances would have a minor reduction in impacts to sediment loading, but all other aspects of the Proposed Action would persist.	No aspect of the Preferred Alternative would reduce or alter the impacts described under the AMA.
Surface and Groundwater	No substantive impacts anticipated unless coal-bed methane or other resource development occurs.	Potential for a slight increase in sediment loading downstream. BMPs and regulatory requirements would minimize this potential.	Impacts would be the same as the Proposed Action.	Secondary impacts would be the same as the Proposed Action.
Vegetation and Wetlands	The Thunder Basin CI/CP would replace 800 acres of conifers with sagebrush or grassland which would be beneficial once established. No other substantive impacts anticipated.	Potential long-term (>15 years) recovery required for up to 568 acres in the disturbed area, including the 165 acres of shrublands in the road footprint. No long-term effects anticipated for drainage bottom habitats (potential wetland) after reclamation.	No aspect of the AMA would reduce or alter the acreages disturbed.	Secondary impacts would be the same as the Proposed Action.
Wildlife	No substantive impacts anticipated beyond those described under Vegetation and Wetlands.	Lost carrying capacity caused by direct habitat loss and avoidance of the AM5 area. Reduction in breeding success and individual and population fitness due to noise effects. Decreased population abundance or density of breeding individuals in habitats adjacent to the road. Higher wildlife mortality, lower reproduction rates, ultimately smaller populations and overall lower population viability during life of the project and some recovery period after. Avoidance and abandonment of active leks by greater sage grouse. Reduced populations of greater sage-grouse resulting from avoidance of elevated structures such as high voltage distribution lines and light poles or resulting from construction noise which exceeds 10 dBA above background. Reduced populations of greater sage-grouse resulting from fragmentation of habitats to a level no longer capable of supporting viable populations.	The AMA has a number of measures to reduce project-caused noise. Therefore there would be fewer effects to wildlife resulting from noise. Displacement, reduction in carrying capacity, reduced breeding success, and reduced population fitness would all be lessened to some extent. The AMA would lessen overall impacts to wildlife. Avoidance and abandonment of active leks by greater sage-grouse. If high voltage distribution lines are buried, secondary impact from predation and behavioral alterations would be reduced. The SGP mitigation plan would provide compensatory mitigation at offsite areas.	Secondary impacts would be the same as the Proposed Action in and around the project area, but the SGP mitigation plan would provide compensatory mitigation at offsite areas.
Aquatics	No substantive impacts anticipated in the absence of the AM5 corridor development.	Grade control structures may “catch” sediments and reduce sediment transport downstream.	Secondary impacts would be the same as the Proposed Action.	Secondary impacts would be the same as the Proposed Action.

Table 5.1-2. Summary of Secondary Impacts for each of the Alternatives Organized by Resource Area				
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**	**Preferred Alternative**
		Once reclamation is completed, aquatic habitat and stream connectivity is expected to recover fully within 2-5 years.		
Cultural Resources	No substantive secondary impacts are anticipated.	No substantive secondary impacts are anticipated.	No substantive secondary impacts are anticipated.	The presence of a tribal monitor or archaeologist may prevent damage or disturbance to any cultural resources discovered during construction or reclamation.
Socioeconomics	No substantive secondary impacts are anticipated.	No secondary impacts to socioeconomics are anticipated.	No secondary impacts to socioeconomics are anticipated.	No secondary impacts to socioeconomics are anticipated.
Transportation and Public Safety	No substantive secondary impacts are anticipated.	No substantive secondary impacts are anticipated..	No substantive secondary impacts are anticipated..	No substantive secondary impacts are anticipated..
Land Use	No substantive secondary impacts are anticipated.	Grazing land, Prime Farmland if Irrigated and Farmland of Statewide Importance would be reduced and taken out of production while the haul road and constructed and in use.	Impacts from Proposed Action related to loss of production would be the same. Fencing could be used to minimize disturbance to these land uses.	Secondary impacts would be the same as the Proposed Action.
Visual Resources	No substantive secondary impacts are anticipated.	Potential long-term (>15 years) recovery of native vegetation required for up to 568 acres in the disturbed area, including 165 acres of shrub lands in the road foot print. No long-term effects anticipated for bottomlands and drainages. Once the haul road section (footprint) is removed and blended back to existing grades.	No aspect of AMA would materially reduce the area of disturbance.	Secondary impacts would be the same as the Proposed Action.
Noise	No substantive secondary impacts are anticipated.	Annoyance is the primary human secondary impact due to intruding noise. Possible secondary effects include stress reactions, sleep interference, efficiency reduction and fatigue. Construction, operational and reclamation noise will be audible at the two residences located within 1.5 miles of the haul road. Although some animals habituate to new noise sources (e.g., big game species), secondary impacts to wildlife occur when noise interferes with auditory signals such as breeding (e.g., sage-grouse) or communication (e.g., raptors and songbirds), causing displacement and/or nest abandonment.	The proposed AMA noise mitigations would reduce, but not eliminate the construction and reclamation noise, and therefore, secondary impacts may still exist. However, noise level measurements (monitoring) during phases of the AM5 project can confirm that noise levels are mitigated to 10 dBA below existing ambient conditions, to reduce wildlife noise impacts.	The noise mitigation agreement that SCM has developed to reduce noise at the residences would reduce secondary impacts due to noise.
Air Quality	No substantive secondary impacts are anticipated.	Slight increase in deposition of fugitive dust on water, soil, and vegetation.	No substantive impacts over those described under the Proposed Action anticipated.	No substantive impacts over those described under the Proposed Action anticipated.

The following table is a summary of the cumulative impacts discussions in Section 4.2. Please see the resource specific subsections for more details on the rationale for these impacts.

Table 5.1-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area				
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**	**Preferred Alternative**
Geology and Minerals	The disturbances associated with the related future actions described in Section 4.1 would be substantial. Coal mining the 3,500 acres would	The impacts to geology from proposed surface mining leases are expected to be similar to cut and fill carried out for the haul road in that it involves removal of native geologic material followed by backfilling with	Cumulative impacts would not be substantially different from the Proposed Action.	Cumulative impacts would not be substantially different from the Proposed Action.

Table 5.1-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area				
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**	**Preferred Alternative**
	remove and redistribute large amounts of mineral resources.	a mixture of overburden and spoils material, thus changing the geologic composition and appearance of the disturbed areas.		
Soils and Reclamation	The potential leases described in Section 4.1 would disturb 3,500 acres of soils as part of the coal mine development. Soils would be handled in compliance with MSUMRA and other regulations outlined in **Table 3.3.1**, which have been designed to minimize long-term effects to soil productivity and maximize revegetation potential.	The larger leases, including the TR-1, discussed under the related future actions are distant from the AM5 area. It is unlikely that any effects due to those actions would contribute to changes in soils in the AM5 area.	Cumulative impacts would not be substantially different from the Proposed Action.	Cumulative impacts would not be substantially different from the Proposed Action.
Surface and Groundwater	There may be impacts to Pearson and South Fork Spring Creeks if the related future actions are approved. This would contribute to cumulative impacts due to diversion of streams in the Upper Tongue River watershed.	There is a possibility that small sediment increases across the Upper Tongue River area from project activities when combined with the related future actions would impact sediment loads, but in the context of the larger watershed the potential is unlikely to be measurable.. Regulatory controls would minimize this potential (**Table 3.4-1**).	Same as the Proposed Action.	Cumulative impacts would not be substantially different from the Proposed Action.
Vegetation and Wetlands	The large area of disturbance included in the proposed leases would cumulatively change the vegetation communities across the area. Because of the uncertainty related to the timing and final project specifics for each of these leases, it is impossible to quantify the total areas of disturbance or types and quantities of vegetation resources potentially affected beyond the acreage estimates provided in **Table 4.1.1**	Potential negative impacts to mosaic of wildlife habitat due to loss of the up to 568 acres of shrublands when added to the over 3,500 acres of other surface disturbing projects proposed in the general vicinity (**Table 4.1-1**). No cumulative effects anticipated for drainage bottom habitats (potential wetland) after reclamation. Potential for non-native and noxious species to increase their overall presence in the general area due to incremental effects of other nearby projects.	Changes in grazing practices have the potential to improve localized vegetation conditions over time. No other aspect of the AMA would contribute to or reduce cumulative effects to vegetation, wetlands, or noxious weeds.	Cumulative impacts would not be substantially different from the AMA.
Wildlife	Removal of coal resources from an additional 3,500 acres would result in habitat fragmentation, noise impacts, displacement, reduction in carrying capacity, reduced breeding success, and reduced population fitness.	Potentially, 3,500 additional acres of coal development within the AM5 area, on top of what has already been permitted would further reduce habitats for wildlife, result in greater habitat fragmentation. Additional wildlife could be lost during construction related activities. Cumulative reduction in habitat for wildlife. Potential for a cumulative reduction in carrying capacity in the SCM area. Wildlife dependent on the habitats which take longer to reclaim (e.g, shrub and woodland habitat) or those that would not be reclaimed (topographic features such as sandstone outcrops and cliff faces) would experience cumulative adverse impacts.	Negative effects due to other actions under consideration would be the same as the Proposed Action, but mitigations described under this alternative would reduce impacts within the AM5 project area. The SGP mitigation plan would provide benefits that may contribute to improving conditions for greater sage-grouse over the long term and potentially reduce the effects of coal activity in the vicinity of the AM5 project.	The SGP mitigation plan would provide benefits that may contribute to improving conditions for greater sage-grouse over the long term and potentially offset the effects of coal activity in the vicinity of the AM5 project.

Table 5.1-3. Summary of Cumulative Impacts for each of the Alternatives Organized by Resource Area				
Resource	**No Action**	**Proposed Action**	**Agency Modified Alternative**	**Preferred Alternative**
Aquatics	Loss of aquatic habitats in Pearson and South Fork Spring Creeks in the Upper Tongue River area for the life of the proposed leases would contribute to cumulative effects to aquatic resources.	Loss of aquatic habitats in multiple creeks across the Upper Tongue River area for the life of the proposed leases and AM5 project would contribute to cumulative effects to aquatic resources.	Negative effects due to other actions under consideration would be the same as the Proposed Action.	Negative effects due to other actions under consideration would be the same as the Proposed Action.
Cultural Resources	Additional surface disturbances would require cultural resource inventories to avoid impacts to these areas. It is impossible to quantify the total areas of disturbance or types and quantities of cultural resources potentially affected beyond the acreage estimates provided in **Table 4.1.1.**	No substantive cumulative impacts are anticipated in addition to those described for the No Action.	No substantive cumulative impacts are anticipated in addition to those described for the No Action.	The presence of a tribal monitor or archaeologist may prevent damage or disturbance to any cultural resources discovered during construction or reclamation.
Socioeconomics	No substantive cumulative impacts are anticipated.	No cumulative impacts to socioeconomics are anticipated	No aspect of the AMA would contribute to or reduce cumulative effects to socioeconomics.	No aspect of the Preferred Alternative would contribute to or reduce cumulative effects to socioeconomics.
Transportation and Public Safety	No substantive cumulative impacts are anticipated.	No substantive cumulative impacts are anticipated.	No substantive cumulative impacts are anticipated.	No substantive cumulative impacts are anticipated.
Land Use	No substantive cumulative impacts are anticipated after required reclamation is completed. Preproject land uses should be able to be re-established.	No substantive cumulative impacts are anticipated. after required reclamation is completed. Preproject land uses should be able to be re-established.	No aspect of the AMA would substantially contribute to or reduce cumulative effects to land use.	No aspect of the Preferred Alternative would substantially contribute to or reduce cumulative effects to land use. The SGP mitigation plan does not specify where off-site mitigation would occur, so it is difficult to quantify if those mitigations would affect land use.
Visual Resources	No substantive cumulative impacts are anticipated. because of the remoteness of the proposed leases and uncertainty regarding the timing and arrangement of these projects.	Potential negative impacts to mosaic landforms and native vegetation due to loss of up to 568 acres. Minimum cumulative effects anticipated for landforms and native vegetation after complete landscape level reclamation. Potential for non-native species to increase their presence in the local area. This may affect the overall landscape vegetation pattern.	No aspect of the AMA would substantially reduce cumulative effects to the visual resource.	No aspect of the AMA would substantially reduce cumulative effects to the visual resource.
Noise	Area noise levels would be expected to increase if the proposed future actions are approved. Leks located closer to the proposed leases would be affected more intensely.	Potential cumulative impacts on noise include conflicts with noise-sensitive receptors, including residences, greater sage grouse, and other noise-sensitive wildlife, such as raptors. These impacts would be intensified where other existing sources have already affected noise levels, such as adjacent SCM operations, oil and gas extraction activities, traffic on local roads and grazing activities. Future actions would also further increase the ambient noise levels, including the addition of a rail spur and additional coal extraction and production in the area.	The proposed AMA noise mitigations would not reduce all the noise of the construction or reclamation activities.	The noise mitigation agreement that SCM has developed to reduce noise at the residences may reduce impacts to these residents due to noise.
Air Quality	Large areas of surface disturbance would have the potential to contribute PM_{10} to the airshed.	Increase in fugitive dust (PM_{10}) in conjunction with permitted mine emission sources, recreational traffic in the area, wildfire, and other private land activities.	No aspect of the AMA would substantially change cumulative effects to the air quality.	No aspect of the Preferred Alternative would substantially change cumulative effects to the air quality.

5.2 Preferred Alternative

The rules and regulations implementing MEPA (ARM 17.4.617) require agencies to indicate a preferred alternative in the Draft EIS, if one has been identified. DEQ has identified certain aspects of the Agency Modified Alternative as the Preferred Alternative for the reasons discussed below.

5.2.1 Rationale for the Preferred Alternative

During the required consultation process in MEPA, SCM has voluntarily committed to implement mitigations identified in the Agency Modified Alternative which are indicated in bolded text rows in **Table 2.4-1** of the Draft EIS. These measures are now part of the Preferred Alternative to minimize project impacts to the environment.

DEQ worked closely with the Montana Sage Grouse Habitat Conservation Program (Sage Grouse Program), who implements the Executive Order No. 12-2015 for the sage grouse conservation strategy with guidance from the Montana Sage Grouse Oversight Team (MSGOT). In the initial development of the Agency Modified Alternative, DEQ and the Sage Grouse Program developed on-site mitigation measures for the project. These on-site mitigation measures are shaded green in **Table 2.4-1**. These on-site measures would be retained in the Agency Modified Alternative, but would not be part of the Preferred Alternative.

While conducting the environmental analysis; DEQ, the Sage Grouse Program, and SCM realized that opportunities for effective, on-site mitigations were limited. Previous anthropogenic disturbances and the cumulative impacts of potential future projects independent of the proposed haul road are already impacting the habitat for greater sage-grouse in the area. Also, any benefits of on-site mitigation would likely be negated by the project itself and the intensive nature and permit duration of the activity now being considered. Therefore, the Sage Grouse Program recommended and the MSGOT approved on April 26, 2018 a plan which includes compensatory mitigation to accomplish off-site mitigation. Plus, SCM voluntarily committed to apply this sage grouse mitigation plan as identified in **Appendix B**.

The Preferred Alternative also includes the following mitigations:

- Blasting: Limit to daytime hours and comply with the requirements of ARM 17.24.624 and 17.24.159,
- Construction Monitoring: Having a tribal representative and/or qualified archaeologist on site during construction

There are two residences that are owned and leased out by SCM. Only one of the two residences is currently occupied. During the analysis, it was identified there could be noise impacts to these residences from the construction phase of the project. The residence in T10S R38E Section 1 is occupied currently, and SCM has committed to take reasonable steps to alleviate noise impacts during the construction phase. SCM does not have any immediate plans for future occupancy of the residence in T9S R39E Section 14.

These measures would minimize noise during construction at human and wildlife receptors near the project. During construction, having a tribal representative and/or qualified archeologist present during construction could minimize disturbances to these cultural features.

DEQ has determined that all aspects of the preferred alternative are reasonable, achievable under current technology, and economically feasible (Section 75-1-201(1)(b)(vi)(C)(I), MCA). DEQ has consulted extensively with SCM regarding all aspects of the preferred alternative, has given due weight and consideration to SCM's comments to date regarding the preferred alternative, and will do so going forward in connection with the formulation of the FEIS (Section 75-1-201(1)(b)(vi)(C)(II), MCA).

Chapter 6 : Consultation and Coordination

DEQ consulted the following agencies during the development of this EIS:

Montana Natural Heritage Program

Montana Sage Grouse Program

Montana State Historic Preservation Office

Montana Department of Fish, Wildlife, and Parks

USDI Bureau of Land Management

Crow Tribe

Crow Tribal Historic Preservation Office (THPO)

Fort Belknap Indian Community

Fort Belknap THPO

Blackfeet Nation

Blackfeet THPO

Fort Peck Tribes

Fort Peck THPO

Northern Cheyenne Tribe

Northern Cheyenne THPO

Chippewa Cree Tribe Rocky Boy Reservation

Rockyboy THPO

Little Shell Tribe of Chipewa Indians

Littleshell THPO

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Chapter 7 : List of Preparers

Resource Area	DEQ Specialist
Cultural	James Strait
Engineering	Ric Casteel
Geology	Kevin Krogstad
Groundwater	Kevin Krogstad
MEPA Coordinator	Craig Jones
Permit Coordinator	Bob Smith
Reviewer	Ed Coleman
Socioeconomics	Jeff Blend
Soils and Reclamation	Julian Calabrese
Surface Water	Adam McMahon
Transportation	Ric Casteel
Vegetation	Mike Glenn
Wetlands	Mike Glenn
Wildlife	Chris Yde, Ben Schmitt
Visual	Craig Jones
Land Use	Mike Glenn
Noise	Bob Smith
Legal Counsel	Mark Lucas

Consultant Team: HydroSolutions	
Cultural	Clarus Backes
Geology	Mike Meredith
Groundwater	Mike Meredith
Reviewer	Dave Donohue

Consultant Team: HydroSolutions	
Socioeconomics	Lauren Waterton
	Pam Spinelli
Soils and Reclamation	Shane Bofto
Surface Water	Mike Meredith
Transportation	Danielle Scharf
Vegetation	Leanne Roulson
Wetlands	Leanne Roulson
Wildlife	Pam Spinelli
Wildlife- sage-grouse	Dale Tribby
Visual	David Groshens
Land Use	Lauren Waterton
Noise	Sean Connolly Kristin Connolly

Chapter 8 : Glossary and Acronyms

List of Acronyms and Symbols

List of Acronyms and Symbols			
%	Percent	LBA	Lease by Application
˚F	Degrees Fahrenheit	LBM	Lease by Modification
<	Less than	LUL	Land Use Lease
>	Greater than	LUP	Land Use Permit
AADT	Average Annual Daily Traffic	MAAQS	Montana Ambient Air Quality Standards
AM5	Amendment 5	MBHFI	Migratory Birds of High Federal Interest
AMA	Agency Modified Alternative	MBTA	Migratory Bird Treaty Act
APE	Area of Potential Effects	MCA	Montana Code Annotated
APLIC	Avian Power Line Interaction Committee	MCL	Maximum Contaminant Level
ARM	Administrative Rules of Montana	MDT	Montana Department of Transportation
ASCM	Alternative Sediment Control Measures	MEPA	Montana Environmental Policy Act
ATFE	Bureau of Alcohol, Tobacco, Firearms, and Explosives	MFISH	Montana Fisheries Information System
ATV	All-terrain vehicle	MFWP	Montana Fish, Wildlife, and Parks
AVF	Alluvial Valley Floor	mg/L	Milligrams per liter (concentration)
BA	Biological Assessment	MMI	Multimetric Index
BACT	Best Available Control Technology	MNHP	Montana Natural Heritage Program
BGEPA	Bald and Golden Eagle Protection Act	MOU	Memorandum of Understanding
BLM	Bureau of Land Management	MP	Milepost

List of Acronyms and Symbols			
BMP	Best Management Practice	MPDES	Montana Pollution Discharge Elimination System
Btu	British thermal units	mph	Miles per hour
CCD	Census County Division	MSGHCP	Montana Sage-grouse Habitat Conservation Program
CDP	Census Designated Place	MSGOT	Montana Sage-Grouse Oversight Team
CFR	Code of Federal Regulations	MSHA	Mine Safety and Health Administration
cfs	Cubic feet per second (referring to water flow)	MSUMRA	Montana Strip and Underground Mine Reclamation Act
CI/CP	Certificate of Inclusion and Certificate of Participation	MWQA	Montana Water Quality Act
CPE	Cloud Peak Energy	NAAQS	National Ambient Air Quality Standards
CPI	Livestock Use Index	NEPA	National Environmental Policy Act
CRABS	Cultural Resource Annotated Bibliography System	NF	Non-functioning
CRIS	Cultural Resource Inventory System	NHPA	National Historic Preservation Act
dB	Decibels	NOI	Notice of Intent
dBA	A-weighted decibels	NOT	Notice of Termination
DEQ	Department of Environmental Quality	NPDES	National Pollutant Discharge Elimination System
DNRC	Department of Natural Resources and Conservation	NRCS	USDA Natural Resources Conservation Service
DOE	Department of Energy	NRHP	National Register of Historic Places
EA	Environmental Assessment	NRIS	Natural Resource Inventory System
EC	Electrical Conductivity	NSO	No Surface Occupancy

List of Acronyms and Symbols			
EDAS	Ecological Data Application System	NWI	National Wetland Inventory
EIS	Environmental Impact Statement	OBL	Obligate Wetland Species
EMAP	Environmental Monitoring and Assessment	OSHA	Occupational Safety & Health Administration
EO	Executive Order	PFC	Proper Functioning Condition
EPA	U.S. Environmental Protection Agency	PM10	Particulate Matter <10 microns
EPT	Ephemeroptera, Plecoptera, Trichoptera	PMT	Post Mining Topography
ESA	Endangered Species Act	PPAA	Private Property Assessment Act
FAC	Facultative Species	PSD	Prevention of Significant Deterioration
FACU	Facultative Upland Species	PTE	Potential to Emit
FACW	Facultative Wetland Species	RFDA	Reasonable Foreseeable Development Area
FAR	Functional at Risk	ROD	Record of Decision
FONSI	Finding of No Significant Impact	ROI	Region of Influence
FTA	Federal Transit Administration	ROW	Right-of-way
GIS	Geographic Information System	SAR	Sodium Adsorption Ratio
GLO	General Land Office	SCM	Spring Creek Mine
gpm	Gallons per minute	SHPO	State Historic Preservation Office
GPS	Global Positioning System	SO	Secretarial Order
GSGHCAC	Greater Sage-grouse Habitat Conservation Advisory Council	SWPPP	Storm Water Pollution Prevention Plan
GWIC	Groundwater Information Center	TCP	Traditional Cultural Properties

List of Acronyms and Symbols			
HAP	Hazardous Air Pollutant	TDS	Total Dissolved Solids
HBI	Hilsenhoff Biotic Index	TES	Threatened, Endangered and Sensitive
Hz	Hertz	TMDL	Total Maximum Daily Load
IBI	Integrated Biotic Index	TPY	Tons per Year
ICCTA	Interstate Commerce Commission Termination Act	UPL	Upland Species
IEMB	Industrial and Energy Minerals Bureau	US DOT	United States Department of Transportation
Kf	Soil Erodibility Factor	USACE	US Army Corps of Engineers
kg	kilogram	USFS	U.S. Forest Service
kv	Kilovolts	USFWS	U.S. Fish & Wildlife Service
L_{dn}	Day-night average noise level	USGS	U.S. Geological Survey
L_{eq}	Equivalent noise level	VOC	Volatile Organic Compounds
L_{max}	Maximum noise level	WNv	West Nile Virus
L_{50}	50th percentile-exceeded noise	YCM	Youngs Creek Mine
L_{90}	90th percentile-exceeded noise		

Glossary

Term	Definition
A	
active mining period	Areas in a surface mining operation where mining is taking place or areas where mining is complete and reclamation activities are taking place.
air pollutant	Any substance in air that could, in high enough concentration, harm animals, humans, vegetation, and/or materials. Such pollutants may be present as solid particles, liquid droplets, or gases. Air pollutants fall into two main groups: (1) those emitted from identifiable sources and, (2) those formed in the air by interaction between other pollutants.

Term	Definition
A	
air quality	A measure of the health-related and visual characteristics of the air, often derived from quantitative measurements of the concentrations of specific injurious or contaminating substances.
alkalinity	The extent to which water or soil contains soluble mineral salts.
alluvium	Unconsolidated material that is deposited by flowing water.
alternative	A MEPA term that refers to a way of achieving the same purpose and need for a project that is different from the recommended proposal; alternatives should be studied, developed, and described to address any proposal which involves unresolved conflicts concerning different uses of available resources. Analysis scenarios presented in a comparative form, to facilitate a sharp definition of the issues resulting in a basis for evaluation among options by the decision maker and the public.
ambient	Surrounding, existing. Of the environment surrounding a body, encompassing on all sides. Most commonly applied to air quality and noise.
analysis area	The geographical area being targeted in the analysis as related to the area of the proposed project.
annuals	Plants that complete their life cycle and die in one year or less.
anthropogenic	Impacts originating in human activity.
appropriation	The act of diverting, impounding, or withdrawing, including by stock for stock water, a quantity of water for a beneficial use.
aquifer	A water-bearing geological formation capable of yielding water in sufficient quantity to constitute a usable supply.
attainment area	An area that the U.S. Environmental Protection Agency has designated as being in compliance with one or more of the National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants but not for others.
B	
backfilling and grading	The operation of refilling an excavation and finishing the surface.
Bald and Golden Eagle Protection Act	An act enacted in 1940 that prohibits “take” of a bald or golden eagle without a permit from the Secretary of the Interior. “Take” is defined as “take, possesses, sell, purchase, barter, offer to sell, export, or import, at any time or in any manner, any bald eagle … [or any golden eagle], alive or dead, or any part, nest, or egg thereof.”
base flow	Sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced streamflows. Natural base flow is sustained largely by groundwater discharges.
baseline	The existing conditions against which impacts of the alternatives are compared.

Term	Definition
Best Management Practices	Structural, non-structural, and managerial techniques that are recognized to be the most effective and practicable means to reduce or prevent water pollution.
biodiversity	A term that describes the variety of life-forms, the ecological role they perform, and the genetic diversity they contain.
blasting	The act of removing, opening, or forming by or as if by an explosive.
bond release	Return of a performance bond to the coal operator after the regulatory agency has inspected and evaluated the completed reclamation operations and determined that all regulatory requirements have been satisfied.
bottomless arch culvert	A type of culvert with rounded sides and top attached to concrete or steel footings set below stream grade. The natural stream channel and substrate run through the length of the culvert, providing streambed conditions similar to the native stream channel.
C	
clinker	baked sedimentary rock formed during natural burning of coal bed
confluence	The point where two streams meet.
corridor	A defined tract of land, usually linear. Can also refer to lands through which a species must travel to reach habitat suitable for reproduction and other life-sustaining needs.
criteria air contaminant (CAC) (or criteria air pollutant)	A set of air pollutants that cause smog, acid rain, and other health hazards. They are typically products of fossil-fuel combustion and are emitted from many sources in industry, mining, transportation, electricity generation, and agriculture. The following six CACs were the first set of pollutants recognized by EPA as needing standards on a national level: particulate matter, nitrogen oxides, ozone, carbon monoxide, sulfur oxides, and lead.
criteria pollutant	An air pollutant that is regulated by the National Ambient Air Quality Standards (NAAQS). Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than 10 micrometers (0.0004 inch) in aerodynamic diameter, and less than 2.5 micrometers (0.0001 inch) in aerodynamic diameter. Pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available. Note: Sometimes pollutants regulated by state laws also are called criteria pollutants.
cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
D	
Day-night average noise level (L_{dn})	A noise metric that represents the constantly varying sound level during a continuous 24-hour period.
dBA or decibels A scale	A logarithmic unit for measuring sound intensity, using the decibel A-weighted scale, which approximates the sound levels heard by the human ear at moderate sound levels, with a 10-decibel increase being a doubling in sound loudness.

Term	Definition
degradation	A process by which the quality of water in the natural environment is lowered. When used specifically in regard to DEQ's nondegradation rules, this term can relate to a reduction in quantity as well.
dilution	The reduction of a concentration of a substance in air or water.
disturbed area	An area where vegetation, topsoil, or overburden is removed or upon which topsoil, spoil, and processed waste is placed as a result of mining.
downgradient	The direction that ground water flows, which is from areas of high ground water levels to areas of low ground water levels.
drilling	The act of boring or driving a hole into something solid.
E	
effluent	Waste liquid discharge.
electrical conductivity	A measure of soluble salts in soil (salinity of a soil).
embedded	To partially bury or entrench in substrate.
embeddedness	The degree to which rocks are covered by the substrate material (sand, clay, silt, etc.).
emission	Effluent discharged into the atmosphere, usually specified by mass per unit time, and considered when analyzing air quality.
emissions inventory	An emission inventory is an accounting of the amount of pollutants discharged into the atmosphere.
endangered species	Any species of plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.
Endangered Species Act	An act of Congress, enacted in 1973, to protect and recover threatened or endangered plant or animal species and their habitats. The Secretary of the Interior, in accordance with the act, identifies or lists the species as "threatened" or "endangered."
Environmental Assessment (EA)	A concise public document that an agency prepares under the Montana Environmental Policy Act to provide sufficient evidence and analysis to determine whether a proposed action requires preparation of an Environmental Impact Statement (EIS) or whether a Finding of No Significant Impact can be issued. An EA must include brief discussions on the need for the proposal, the alternatives, the environmental impacts of the proposed action and alternatives, and a list of agencies and persons consulted.
environmental consequences	Environmental effects of project alternatives, including the proposed action, which cannot be avoided; the relationship between short-term uses of the human environment, and any irreversible or irretrievable commitments of resources which would be involved if the proposal should be implemented.
Environmental Impact Statement (EIS)	A document prepared to analyze the impacts on the environment of a proposed action and released to the public for review and comment. An EIS must meet the requirements of MEPA, CEQ, and the directives of the agency responsible for the proposed action.
ephemeral stream	A stream that flows only as a direct response to rainfall or snowmelt events, having no baseflow from ground water.

Term	Definition
Equivalent noise level (L_{eq})	An environmental noise metric, similar to an average, to describe the constantly fluctuating instantaneous noise levels at a location.
evaporation	The physical process by which a liquid is transformed to a gaseous state.
evapotranspiration	The water lost from an area through the combined effects of evaporation from free surfaces and transpiration from plants.
exclosure	An area from which unwanted browsing or grazing animals are excluded by fencing or other means.
F	
fault	A fracture or fracture zone where there has been displacement of the sides relative to one another.
forb	Any herbaceous plant, usually broadleaved, that is not a grass or grass-like plant.
fugitive emissions	1. Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device. 2. Any air pollutant emitted to the atmosphere other than from a stack. Sources of fugitive emissions include pumps; valves; flanges; seals; area sources such as ponds, lagoons, landfills, piles of stored material (e.g., coal); and road construction areas or other areas where earthwork is occurring.
G	
genus	A group of related species used in the classification of organisms (plural = genera).
H	
habituate	Become accustomed to.
hardness	A measure of the amount of calcium and magnesium dissolved in the water.
Hazardous Air Pollutants	pollutants which are not covered by NAAQS and which may, at
hazardous air pollutants (HAPs)	Air pollutants not covered by the National Ambient Air Quality Standards (NAAQS) but which may present a threat of adverse human health effects or adverse environmental effects. Those specifically listed in 40 CFR 61.01 are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, HAPs are any of the 189 pollutants listed in or pursuant to section 112(b) of the Clean Air Act. Very generally, HAPs are any air pollutants that may realistically be expected to pose a threat to human health or welfare.
haze	A form of air pollution caused when sunlight encounters tiny pollution particles in the air, which reduce the clarity and color of what we see, and particularly during humid conditions.
headcut	A break in the slope of an intermittent or perennial waterway that forms a "waterfall" which in turn causes the underlying soil to erode and the channel to expand uphill.
heavy metals	Metallic elements with high molecular weights, generally toxic in low concentrations to plants and animals.
highwall	The face of exposed overburden and mineral in surface mining operations or for entry to underground mining operations.
historic properties	Cultural resources that are listed on or eligible for listing on the NRHP.
home range	An area in which an individual animal spends most of its time doing normal activities.

Term	Definition
hydraulic conductivity	The rate of flow of water through geologic material.
hydric soil	A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.
hydrophytic	Growing either partly or totally submerged in water. Plants that are capable of growing under such conditions.
I	
incised	Having a margin that is deeply and sharply notched.
intermittent stream	A stream or reach of stream that is below the local water table for at least some of the year, and obtains its flow from both surface runoff and ground water discharge.
L	
L_{50} (50th percentile-exceeded noise level)	A noise metric that represents the single noise level exceeded during 50 percent of a measurement period. The L_{50} is the median noise level during a period of time.
L_{90} (90th percentile-exceeded noise level)	A noise metric that represents the noise level exceeded during 90 percent of a measurement period, and is typically considered the ambient noise level.
land use	The activities and inputs undertaken in a certain land cover type, or the way in which land is managed (e.g., grazing pastures, managed forests).
land-use change	Change in the use of land by humans that may result in a change in land cover.
lek	An assembly area where animals, especially grouse, carry on display and courtship behavior.
life-of-mine	Length of time after permitting during which coal is extracted and mine-related activities can occur.
lithology	The structure and composition of a rock formation.
loading	The quantity of material or chemicals entering the environment, such as a receiving stream.
long-term effect	A change in a resource or its condition that does not immediately return the resource to pre-mine condition, appearance, or productivity; long-term impacts would apply to changes in condition that continue beyond the bond liability period but would be expected to eventually return to pre-mine condition, or as required under the Surface Mining Control and Reclamation Act (SMCRA) or the Montana Surface and Underground Mine Reclamation Act (MSUMRA).
M	
macroinvertebrates	Small animals without backbones that are visible without a microscope (e.g., insects, small crustaceans, and worms).
macrophytes	Plants visible to the unaided eye. In terms of plants found in wetlands, macrophytes are the conspicuous multicellular plants.
mainstem	The primary channel in a stream or river.
maximum noise level (L_{max})	A noise metric denotes the maximum instantaneous sound level recorded during a measurement period.

Term	Definition
mean	The average number of a set of values.
mean annual high water	The annual flood is defined as the highest instantaneous peak flow each year at a gage site on a river. Therefore, the mean annual high water is the arithmetic average of all the annual flood levels for the gage period of record or other specified time interval.
median	A numerical value in the midpoint of a range of values with half the value points above and half the points below.
mesic	Having intermediate or moderate moisture or temperature; or reference to organisms adapted to moderate climates.
metric	A value calculated from existing data and used for summarization purposes.
Migratory Bird Treaty Act	Enacted in 1918 between the United States and several other countries. The act forbids any person without a permit to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird."
mitigation	An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.
Montana Natural Heritage Program	The Montana Natural Heritage Program provides information on Montana's species and habitats, emphasizing those of conservation concern.
N	
National Ambient Air Quality Standards (NAAQS)	The allowable concentrations of air pollutants in the ambient (public outdoor) air. National ambient air quality standards are based on the air quality
National Emissions Standards for	Emissions standards set by the Environmental Protection Agency for air
No Action Alternative	A MEPA term that refers to the alternative in which the proposed action is not taken. For many actions, the No Action Alternative represents a scenario in which current conditions and trends are projected into the future without another proposed action, such as updating a land management plan. In other cases, the No Action Alternative represents the future in which the action does not take place and the project is not implemented.
nonattainment area	An area that the U.S. Environmental Protection Agency has designated as not meeting (i.e., not being in attainment of) one or more of the National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants, but not for others.
noxious weed	Any exotic plant species established or that may be introduced in the state that may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses, or that may harm native plant communities.
O	

Term	Definition
opportunistic species	A species that can adapt to, and take advantage of, a variety of habitats or situations. This ability provides a benefit to the species in its distribution, numbers, and survival during changing conditions.
orthophoto	An aerial photograph or image geometrically corrected ("orthorectified") such that the scale is uniform: the photo has the same lack of distortion as a map.
overburden	Geologic material of any nature that overlies a deposit of ore or coal, excluding topsoil.
P	
particulate matter (pm)	A complex mixture of extremely small particles and liquid droplets that get into the air. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. PM10 includes only those particles equal to or less than 10 micrometers (0.0004 inch) in aerodynamic diameter; PM2.5 includes only those particles equal to or less than 2.5 aerodynamic micrometers (0.0001 inch) in diameter.
peak flow	The maximum flow of a stream in a specified period of time.
perennial stream	A stream or reach of a stream that flows continuously during all of the year as a result of ground water discharge or surface runoff.
perennials	Plants that live longer than 2 years.
periphyton	Organisms (as some algae) that live attached to underwater surfaces.
permafrost	Ground (soil, rock, or sediment) that remains frozen for more than two consecutive years.
permeable	Allowing the passage of fluids.
pH	A method of expressing the acidity or basicity of a solution; the pH scale runs from 0 to 14, with a value of 7 indicating a neutral solution. Values greater than 7 indicate basic or alkaline solutions, and those below 7 indicate acidic solutions.
piezometer	A small well used to measure the ground water surface.
population	A collection of individuals that share a common gene pool. In this document, local population refers to those breeding individuals within the analysis area.
postmining land use	The specific use or management-related activity to which a disturbed area is restored after completion of mining and reclamation.
postmining topography	The relief and contour of the land that remains after backfilling of the mine pit, grading, and recontouring have been completed.
prevention of significant deterioration (of air quality) (PSD)	Regulations established to prevent significant deterioration of air quality in areas that already meet NAAQS. Specific details of PSD are found in 40 CFR 51.166.
primary impact	An impact caused by an action and that occurs at the same time and place as the action.

Term	Definition
prime farmland	Land that (a) meets the criteria for prime farmland prescribed by the United States Secretary of Agriculture in the Federal Register and (b) historically has been used for intensive agricultural purposes.
Proposed Action	A MEPA term referring to a plan that contains sufficient details about the intended actions to be taken, or that will result, to allow alternatives to be developed and its environmental impacts analyzed.
public health	The science of protecting the safety and improving the health of communities through education, policy making and research for disease and injury prevention.
Q	
Q100	The flow estimated for the 100-year flood of a stream or river, or a flood event that has a one percent probability of occurring in any given year.
R	
raptors	Birds of prey (e.g., hawks, owls, vultures, eagles)
reclamation	Per MSUMRA at Section 82-4-203(44), Montana Code Annotated (MCA), reclamation means backfilling, subsidence stabilization, water control, grading, highwall reduction, topsoiling, planting, revegetation, and other work conducted on lands affected by surface mining or underground mining under a plan approved by the department to make those lands capable of supporting the uses that those lands were capable of supporting prior to any mining or to higher or better uses.
recontouring	The movement of quantities of earth, usually by mechanical means, to reconfigure the relief and contour of the land.
regeneration	Regrowth of a tree crop or other vegetation, whether by natural or artificial means.
regional haze	Visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources, and area sources. (40 CFR 51.301)
revegetation	Plant growth that replaces original ground cover following land disturbance.
riparian areas	Areas with distinct resource values and characteristics that comprise an aquatic ecosystem, and adjacent upland areas that have direct relationships with the aquatic system. This includes floodplains, wetlands, and lake shores.
ripped	Torn, split apart, or opened.
S	
saline soil	A nonsodic soil containing sufficient soluble salt to adversely affect the growth of most plants.
saturation percent	The water content of a saturated soil paste, expressed as a dry weight percentage.
scoria (clinker)	Baked and fused rock resulting from in-place burning of coal deposits.
secondary impact	An impact caused by an action but that occurs later in time (reasonably foreseeable) or farther away in distance.
sedge	A grass-like plant, often associated with moist or wet environments.

Term	Definition
sediment-control pond/sediment trap	A sediment-control structure, including a barrier, dam, or excavation depression, that slows down runoff water to allow sediment to settle out.
seep	A place where ground water flows slowly out of the ground.
seismic	Of or produced by earthquakes. Of or relating to an earth vibration caused by something else (e.g., an explosion).
sensitive species	Those species, plant and animal, identified by the Montana Natural Heritage Program for which population viability is a concern, as evidenced by (1) significant current or predicted downward trends in population numbers or density or (2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
short-term effect	A change that within a short period would no longer be detectable as the resource is returned to its pre-mine condition, appearance, or use. In this EIS a "short period" is defined as the length of the Area F bond liability period (see **Chapter 1, Section 1.6, Financial Assurance** for a description of the bond liability period).
slopewash alluvium	Soil and rock material that has been moved down a slope predominantly by the action of gravity assisted by the action of running water that is not concentrated into channels.
sodic soil	A nonsaline soil containing sufficient exchangeable sodium to adversely affect plant growth and soil structure.
sodium adsorption ratio (SAR)	A relation between soluble sodium and soluble divalent cations that can be used to predict the exchangeable sodium percentage of soil equilibrated with a given solution.
soil erodibility	A measure of the inherent susceptibility of a soil to erosion, without regard to topography, vegetation cover, management, or weather conditions.
soil pH	The negative logarithm of the hydrogen ion activity of a soil. The degree of acidity or alkalinity.
soil texture	Soil textural units are based on the relative proportions of sand, silt, and clay.
soil threshold concentration	The metal concentration that equals 1 percent of the 95 percent Upper Confidence Limit (95 percent UCL) on the mean of the background concentration.
spoil	Overburden that has been removed during surface or underground mining operations.
spring	A localized point of discharge where ground water emerges onto the land or into a surface water body.
stratigraphy	The arrangement of strata (layers).
stratum	A section of a formation that consists of primarily the same rock type.
subpopulation	A well-defined set of interacting individuals that comprise a portion of a larger, interbreeding population.
sustainability	The ability of a population to maintain a relatively stable population size over time.
T	
taxonomic level	A hierachical defined group of organisms such as genus, species, or family.
Tertiary	The earlier of two geologic periods in the Cenozoic Era, in the classification generally used. Also, the system of strata deposited during that period.

Term	Definition
threatened species	Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, as identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.
total dissolved solids	A measure of the amount of material dissolved in water (mostly inorganic salts).
total maximum daily load	is a regulatory term in the U.S. Clean Water Act, describing a plan for restoring impaired waters that identifies the **maximum**amount of a pollutant that a body of water can receive while still meeting water quality standards
total suspended solids	A measure of the amount of undissolved particles suspended in water.
toxic parameter	A chemical that has an immediate, deleterious effect on the metabolism of a living organism.
transect	A line, strip, or series of plots from which biological samples, such as vegetation, are taken.
tributary	A stream that flows into a larger water body.
trigger value	A value listed in DEQ Circular WQB-7 for a toxic parameter, used to determine if proposed activities will cause degradation.
U	
unconsolidated deposits	Sediment not cemented together, containing sand, silt, clay, and organic material.
ungulate	An animal having hooves.
upgradient	The direction from which ground water flows.
V	
vadose zone	The Earth's terrestrial, unsaturated subsurface that extends from the surface to the regional groundwater table
viability	Ability of a population to maintain sufficient size so that it persists over time in spite of normal fluctuations in numbers; usually expressed as a probability of maintaining a specific population for a specific period.
viewshed	The portion of the surrounding landscape that is visible from a single observation point or set of points.
visibility	The distance to which an observer can distinguish objects from their background. The determinants of visibility include the characteristics of the target object (shape, size, color, and pattern), the angle and intensity of sunlight, the observer's eyesight, and any screening present between the viewer and the object (i.e., vegetation, landform, even pollution such as regional haze).
W	
water of the U.S.	Waters including all interstate waters used in interstate or foreign commerce, tributaries of these, territorial seas at the high-tide mark, and wetlands adjacent to all of these.
watershed	The lands drained by a system of connected drainages. The area of land where all of the water that falls in it and drains off of it goes to a common outlet.
wetlands	Areas that are inundated or saturated by surface or ground water for a sufficient duration and frequency to support a prevalence of vegetation

Term	Definition
	typically adapted for such conditions and that exhibit characteristics of saturated soils.

Chapter 9 : References

Abbott, T. 2016. USFWS Ecological Services Office - Cheyenne, Wyoming, personal communication with Gwyn McKee, Great Plains Wildlife Consulting, Inc.

Ackerman, L. 2017a. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. Powerline in transportation corridor. Received May 1, 2017.

Ackerman, L. 2017b. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. Haul truck cycles to CraigJones.xls Includes attachments. Received May 1, 2017.

Ackerman, L. 2017c. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. RE: A few more questions from contractor. Received May 8, 2017.

Ackerman, L. 2017d. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. RE: A few more questions from contractor. Includes attachments. Received May 8, 2017.

Ackerman, L. 2017e. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. RE Site Visit Follow up questions-employment. Received May 22, 2017.

Ackerman, L. 2017f. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. RE Site Visit Follow up questions: roads, fencing, construction. Received May 22, 2017.

Ackerman, L. 2017g. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. RE Hours of use on haul road. Received June 13, 2017.

Ackerman, L. 2017h. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of

Environmental Quality. Helena, Montana. RE Transportation timing, truck trips, wildlife references, geology. Received June 3, 2017.

Ackerman, L. 2017i. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. ARROWHEAD ROAD EIS: TS piles and road topo cut into surrounding topo. Attachments: DWG file. Received June 12, 2017.

Ackerman, L. 2017j. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. ARROWHEAD Amendment MDEQ NEPA Questions. Received June 17, 2017. Attachments: Data for SCM Haul road Amendment NEPA Questions.docx; NEPA Work 3D AHA HAUL ROAD PROFILE.pdf; NEPA_Work_ Haul road quality table.pdf

Ackerman, L. 2017k. Senior Environmental Engineer, Cloud Peak Energy Resources, Email to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. RE: A few more questions. Attachment: 20170629_DataRequest. Received July 7, 2017.

Ambrose, S. and Florian, C. 2013. "Sound Levels of Gas Field Activities at Greater Sage-grouse Leks, Pinedale Anticline Project Area, Wyoming, April 2013".

Aqua Terra Consultants, Inc. 2015a. Alluvial Valley Floor Assessment: Arrowhead Amendment Area, Spring Creek Coal Mine. Sheridan: Unpublished report.

Aqua Terra Consultants, Inc. 2015b. Appendix N: Topography, Geology, Mineral Assessment and Strata Quality Characteristics. Sheridan: Unpublished report.

Aqua Terra Consultants, Inc. 2017. Appendix I, Volume 5 - Pre-mine Hydrology for Arrowhead Amendment. Sheridan: Unpublished report.

Associated Press. 2008. Work Begins on Train from Bull Mountain Coal Mine. Posted on August 20, 2008. Accessed on May 9, 2017. http://missoulian.com/news/state-and-regional/work-begins-on-train-from-bull-mountain-coal-minepostedon/article_831f3b3d-1ea1-52d0-b919-3c2635338a03.html

Atamian, M. T., J. S. Sedinger, J. S. Heaton, and E. J. Blomberg. 2010. Landscape-level assessment of brood rearing habitat for greater sage-grouse in Nevada. Journal of Wildlife Management 74: 1533-1543.

Baker, W. L. 2011. Pre-Euro-American and recent fire in sagebrush ecosystems. Pp 185-201 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Barbour, M.T., J. Gerritsen, B. D. Snyder, and J. B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers. EPA-841-B-99-002, Washington, DC: US Environmental Protection Agency.

Baruch-Mordo, S., J. S. Evans, J. P. Severson, D. E. Naugle, J. D. Maestas, J. M. Kiesecker, M. J. Falkowski, C. A. Hagen, and K. P. Reese. 2013. Saving sage-grouse from the trees: A proactive solution to reducing a key threat to a candidate species. Biological Conservation 167: 233-241.

Beach, F.C. 2013. Policy Course Lecture Notes: Chapter 4 Coal Transportation. Univ. of Texas. Dept. of Chemical Engineering. Energy and Technology https://www.che.utexas.edu/course/che359&384/lecture_notes/topic_3/Chapter4.pdf . Accessed May 5, 2017.

Beaver, J. 2015. Baseline Wetlands Inventory, Spring Creek Mine Arrowhead Amendment, Aquatic Resources Inventory (Appendix L2B), Big Horn County, Montana. Unpublished technical report for Cloud Peak Energy, Inc. by WESTECH Environmental Services, Inc., Helena, Montana. 16 p. + 247 p. appendices + 1 map (4 sheets).

Beck, T. D. I. 1977. Sage grouse flock characteristics and habitat selection in winter. Journal of Wildlife Management 41:18–26.

Beier, P. 1995. Dispersal of juvenile cougars in fragmented habitat. J. Wildl. Manage. 59(2):228-237.

Berry, J. D., R. L. Eng. 1985. Interseasonal Movements and Fidelity to Seasonal Use Areas by Female Sage Grouse. The Journal of Wildlife Management 49:237-240.

Big Horn County. 2014. Big Horn County Growth Policy. Big Horn County Board of County Commissioners. http://www.bighorncountymt.gov/wp-content/uploads/2015/05/GROWTH-POLICY-Big-Horn-County-MAY-2014-PDF.pdf

Blickley, J. L., D. Blackwood and G. L. Patricelli. 2012. Experimental Evidence for the Effects of Chronic Anthropogenic Noise on Abundance of Greater Sage-Grouse at Leks. Conservation Biology. Volume 26, No. 3, 461–471.

Bollman, C. 2017. Fisheries Biologist for Montana Fish, Wildlife and Parks, Region 7. Personal Communication with Leanne Roulson, Fisheries Biologist, HydroSolutions on June 28, 2017.

Bouska, W. W. and C. P. Paukert 2010. Road Crossing Designs and Their Impact on Fish Assemblages of Great Plains Streams, Transactions of the American Fisheries Society, 139(1): 214-222, DOI: 10.1577/T09-040.1

Bramblett, R.G., T. R. Johnson, A. V. Zale & D. G. Heggem. 2005. Development and Evaluation of a Fish Assemblage Index of Biotic Integrity for Northwestern Great Plains Streams, Transactions of the American Fisheries Society, 134:3, 624-640, DOI: 10.1577/T04-051.1 Abstract available online at: http://dx.doi.org/10.1577/T04-051.1

Bureau of Land Management (BLM), 1990. Bull Mountains Exchange Final Environmental Impact Statement. November.

Carpenter, J., C. Aldridge, M. Boyce. 2010. Sage-Grouse Habitat Selection During Winter in Alberta. Journal of Wildlife Management 78(8):1806–1814.

Cavanaugh, W. and Tocci, G.C. 2002. "Criteria for Community Acceptance of Outdoor Concert Sound. A Progress Report on Continuing Research." The 2002 International Congress and Exposition on Noise Control Engineering, Dearborn, MI, August 19-21, 2002.

Clean Water Act Information Center (CWAIC). 2016. Water Quality Standards Attainment Record. Squirrel Creek (MT42B001_010). Montana Department of Environmental Quality, Water Quality Bureau. Helena, MT. http://deq.mt.gov/Portals/112/Water/WQPB/CWAIC/Reports/2016/MT42B002_010.pdf

Clean Water Act Information Center (CWAIC). 2016. Water Quality Standards Attainment Record. Upper Tongue River (MT42B001_010). Montana Department of Environmental Quality Water Quality Bureau. Helena, MT. http://deq.mt.gov/Portals/112/Water/WQPB/CWAIC/Reports/2016/MT42B001_010.pdf

Colorado Water Conservation Board (CWCB). 2008. Colorado Floodplain and Stormwater Criteria Manual. Chapter 9. Hydrologic Ananlysis, Section 6 Mean Annual Flow. CH09-601. State of Colorado. http://cwcb.state.co.us/technical-resources/floodplain-stormwater-criteria-manual/Documents/Chapter%209/Chapter%209%20Section%206.pdf

Connelly, J. W., and C. E. Braun. 1997. Long-term changes in sage grouse *Centrocercus urophasianus* populations in western North America. Wildlife Biology 3:229–234

Connelly, J. W., E. T. Rinkes, C. E. Braun. 2011. Characteristics of Greater Sage-Grouse habitats: a landscape species at micro- and macroscales. Pp 69-83 *in* S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Connelly, J.W., C. A. Hagen, and M. A. Schroeder. 2011. Characteristics and Dynamics of Greater Sage-Grouse Populations. Pp 53-67 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines to manage sage grouse populations and their habitats. Wildlife Society Bulletin 28:967–985.

Cowardin, L., Carter, V., Golet, F.C., & LaRoe, E.T. 1979. Classification of Wetlands and Deepwater Habitats of the United States. USFWS.

Crawford, J. A., R. A. Olson, N. E. West, J. C. Moseley, M. A. Schroeder,T. D. Whitson, R. F. Miller, M. A. Gregg, and C. S. Boyd. 2004. Ecology and management of sage-grouse and sage-grouse habitat. Journal of Range Management 57:2–19.

Culwell, L.D., K.L Scow, L.A. Larsen and A. Kratz. 1987. *Guide to the Natural Vegetation of Montana*. Unpublished draft report for the Montana Natural Heritage Program by Western Technology and Engineering, Inc., Helena, Montana. 389 p.

DEQ. (n.d.). Decker Area Groundwater Cumulative Hydrologic Impact Assessment (CHIA): Spring Creek Mine, East and West Decker Mines, Bighorn County, Montana. Helena: Montana Department of Environmental Quality.

DEQ. 1998. Soil, Overburden and Regraded Spoil Guidelines, December 1994. Helena: Montana Department of Environmental Quality.

DEQ. 2011. Citizens' Guide to Air Quality in Montana. February 18. Accessed March 18, 2013. http://www.deq.mt.gov/airmonitoring/citguide/understanding.mcpx .

DEQ. 2012. Water Quality Assessment Method. Prepared by the Water Quality planning Bureau. Montana Department of Environmental Quality, Helena. WQPBWQM-001.

DEQ. 2014. "Montana Air Quality Permit #1120-012." *ARM Permits.* October 16. Accessed May 23, 2017. https://deq.mt.gov/Portals/112/Air/AirQuality/Documents/ARMpermits/1120-12.pdf .

DEQ. 2016a. *Citizens' Guide to Air Quality in Montana.* February 18. Accessed May 22, 2017. http://deq.mt.gov/Air/airmonitoring/citguide/understanding .

DEQ. 2016b. "Air Quality Monitoring Network Plan." May. Accessed May 22, 2017. https://deq.mt.gov/Portals/112/Air/AirMonitoring/Documents/2016_NETWORK_PLAN_FINAL.pdf .

DEQ. 2017a. *Air Quality Nonattainment Information.* Accessed May 22, 2017. http://deq.mt.gov/Air/airquality/Planning/airnonattainment .

DEQ. 2017b. *Air Quality Facility Information.* May 22. Accessed May 22, 2017. https://svc.mt.gov/deq/dst/#/app/airfac/results/county/BIG%2520HORN/0/0 .

DNRC. 2014. *Tongue River Dam Fact Sheet.* Helena: Montana Department of Natural Resources and Conservation. http://dnrc.mt.gov/divisions/water/projects/docs/factsheets/tongue_factsheet.pdf .

DNRC. 2017. *Montana DNRC.* Accessed June 19, 2017. http://dnrc.mt.gov/licenses-and-permits/stream-permitting.

Doherty, K. E., D. E. Naugle and B. L. Walker. 2010. Greater Sage-Grouse Nesting Habitat: The Importance of Managing at Multiple Scales. Journal of Wildlife Management 74(7):1544-1553.

Doherty, K. E., D. E. Naugle, B. L. Walker, and J. M. Graham. 2008. Greater sage-grouse winter habitat selection and energy development. Journal of Wildlife Management 72:187-195.

DOI. 2016. *Spring Creek Mine, Environmental Assessment.* Electronic, Denver: Office of Surface Mining Reclamation and Enforcement Program Support Division.

Donnelly, J. P., D. E. Naugle, C. A. Hagen, and J. D. Maestas. 2016. Public lands and private waters: scarce mesic resources structure land tenure and sage-grouse distributions. Ecosphere 7(1):e01208. 10.1002/ ecs2.120

Ensign, J. 2018a. Region Seven Wildlife Manager, MFWP. Personal Communication with Dale Tribby, Wildlife Biologist with HydroSolutions on January 3, 2018.

Ensign, J. 2018b. Region 7 Wildlife Manager, Montana Department of Fish, Wildlife and Parks. Email to C. Jones, Montana Department of Environmental Quality. Status of Lek BI-002. January 30, 2018.

EPA. 2017a. *Emission Standards Reference Guide for On-road and Nonroad Vehicle and Engines.* May 17. Accessed May 25, 2017. https://www.epa.gov/emission-standards-reference-guide/basic-information-about-emission-standards-reference-guide-road .

EPA. 2017b. *Air Emissions Factors and Quantification, AP-42: Compilation of Air Emission Factors.* Accessed May 22, 2017. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors .

Epps, C. W., P.J. Palsbøll, J.D., Wehausen, G.K. Roderick, R.R. Ramey and D.R. McCullough. 2005. Highways block gene flow and cause a rapid decline in genetic diversity of desert bighorn sheep. Ecology Letters, (2005) 8: 1029–1038.

Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06.

Flake, L.D, J.W. Connelly, T.R. Kirschenmann and A.J. Lindbloom. 2010. Grouse of Plains and Mountains – The South Dakota Story. South Dakota Department of Game, Fish and Parks, Pierre.

Francis, C.D. and J.R. Barber. 2013. A Framework for Understanding Noise Impacts on Wildlife: An Urgent Conservation Priority. Frontiers in Ecology; The Ecological Society of America.

Gagnon, J.W., N.L. Dodd, K.S. Ogren, R.E. Schweinsburg. 2011. Factors Associated With Use of Wildlife Underpasses and Importance of Long-Term Monitoring. The Journal of Wildlife Management 75(6):1477–1487.

Garton, E.O., J.W. Connelly, J.S. Horne, C.A. Hagen, A. Moser, and M.A. Schroeder. 2011 Greater Sage-Grouse population dynamics and probability of persistence. Pp 293-381 *in* S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Great Plains Wildlife Consulting, Inc. (GPWC). 2017. Spring Creek Mine 2016 Wildlife Monitoring. Prepared for Cloud Peak Energy Resources LLC; Spring Creek Mine. March 2017.

Harris, C., ed. 1998. Handbook of Acoustical Measurements and Noise Control. Acoustical Society of America, New York.

Hatch, L.T. and K.M. Fristrup. 2009. No barrier at the boundaries: implementing regional frameworks for noise management in protected natural areas. Marine Ecology Progress Series 395: 223–244.

Hilsenhoff, W. 1987. "Rapid Field Assessment of Organic Pollution with a Family-Level Biotic Index," Journal of the North American Benthological Society 7, no. 1 (Mar., 1988): 65-68. https://doi.org/10.2307/1467832

International Organization for Standardization (ISO). 1996. Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation. Designation: 9613-2.

Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Prepared for Canadian Association of Petroleum Producers. Arc Wildlife Services Ltd., Calgary. 115pp.

Jessup,B., J.B. Stribling, and C. Hawkins. 2006. Biological Indicators of Stream Condition in Montana Using Benthic Macroinvertebrates. Helena: Unpublished report prepared for the Montana Department of Environmental Quality.

Johnson, D. H., M. J. Holloran, J. W. Connelly, S. E. Hanser, C. L. Amundson, and S. T. Knick. 2011. Influences of environmental and anthropogenic features on Greater Sage-Grouse populations, 1997-2007. Pp 407-450 *in* S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Kamptner, G. 2015. The Albemarle County land use law handbook. Chapter 33: federal laws pertaining to railroads. Albemarle County attorney's office. Virginia. https://www.albemarle.org/upload/images/Forms_Center/Departments/County_Attorney/Forms/LUchapter33-railroads.pdf accessed May 12, 2017.

Kelinman, L.H. and T.C. Richmond. 2000. Sagebrush and mine reclamation: What is needed from here? *in* Schuman, G.E. and T.C. Richmond, editors. Sagebrush Establishment on Mined Lands: Ecology and Research. Proceedings of Symposium, "Sagebrush Establishment on Mined Lands," 2000 Billings Land Reclamation Symposium, March 20-24, 2000, Billings, MT

Knick, S. T. and J. W. Connelly. 2011. Greater Sage-Grouse and sagebrush: an introduction to the landscape. Pp 1-9 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Komatsu. 2009. Komatsu 830E-AC Electric Drive Truck Specifications. Komatsu America Corp.

Komatsu. 2015. "Komatsu 830E-1AC Electric Drive Truck." Accessed May 23, 2017. http://www.komatsuamerica.com/equipment/trucks/electric/830e-1ac .

Kuzara, S., E. Meredith, J. Wheaton, S. Bierach, and D. Sasse. 2016. 2015 Annual Coalbed Methane Regional Groundwater Monitoring Report: Powder River Basin, Montana - Open File Report 679. Butte: Montana Bureau of Mines and Geology.

Lang, M., M. Love, and W. Tush. 2004. Improving Stream Crossings for Fish Passage. National Marine Fisheries Service. Contract No. 50ABNF800082. Available online at: https://www.fs.fed.us/biology/nsaec/fishxing/fplibrary/Lang_2004_Improving_stream_crossing_for_fish_passage_FINAL.pdf

Lesica, P. 2012. *Manual of Montana Vascular Plants.* Botanical Research Institute of Texas Press. Fort Worth, Texas.

Leu, M., and S. E. Hanser, 2011; Influences of the Human Footprint on Sagebrush Landscape Patterns. Pp 253-271 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Liesenfeld, Z. J. 2013. Investigation of Sagebrush Reclamation Success on Bentonite Mined Areas in the Big Horn Basin (Wyoming, USA) M.S. University of Wyoming, Department of Ecosystem Science and Management, May 2013.

Liu, Henry, Robert Zuniga, and James L. Richards, 1993. Economic analysis of coal log pipeline transportation of coal. Capsule Pipeline Research Center University of Missouri-Columbia Report No. 93-1.

Maunder, D. 2017. Director Environmental and Regulatory Affairs, Cloud Peak Energy Resources, Email and attachment to C. Jones. Environmental Compliance, Montana Department of Environmental Quality. Helena, Montana. Arrowhead Haul Road vehicle use. Received November 29, 2017.

MBMG. 2017. Water Quality Standards. June 9. http://mbmggwic.mtech.edu/sqlserver/v11/help/reports/WQStandards.asp .

Menge, C. 2005. "Assessment of Community Reaction to Proposed Club Racetrack." Proceedings of the Institute of Noise Control Engineering (INCE) NOISE-CON 2005 Conference, Minneapolis, Minnesota, October 17-19, 2005.

MFWP 2018. Crucial Area Planning System. Accessed at: http://fwp.mt.gov/gis/maps/caps/

Miller, R.F., D.E. Naugle, J.D. Maestas, C.A. Hagen, and G. Hall. 2017. Special Issue: Targeted Woodland Removal to Recover At-Risk Grouse and Their Sagebrush Steppe and Prairie Ecosystems. Rangeland Ecology and Management 70(1):1-8.

Minnesota Department of Transportation (MNDOT). 2013. Culvert Design for Aquatic Organism Passage: Culvert Design Practices for Incorporating Sediment Transport. Transportation Research Synthesis. Publication TRS 1302. Available online at: http://www.dot.state.mn.us/research/TRS/2013/TRS1302.pdf

Montana Department of Fish, Wildlife and Parks (MFWP). 2005. Management Plan and Conservation Strategies for Sage Grouse in Montana – Final.

Montana Department of Fish, Wildlife and Parks (MFWP). 2017. Bighorn County Lek database.

Montana Department of Natural Resources and Conservation (MDNRC). 2014. Greater Sage-Grouse Habitat Conservation Strategy. Prepared by the Montana Greater Sage-Grouse Conservation Advisory Council. http://fwp.mt.gov/fwpDoc.html?id=62141

Montana Department of Transportation (MDT). 2017. Montana Traffic Data. Statewide traffic Count Site Interactive Map. http://mdt.mt.gov/publications/datastats/traffic_maps.shtml Accessed July 5, 2017.

Montana Fish, Wildlife, and Parks (MFWP). 2015. Sage grouse core areas in general habitat in Montana. Map generated as an attachment of Executive Order. Montana Fish Wildlife and Parks, Helena. Available online at: http://deq.mt.gov/Portals/112/Water/WQInfo/Documents/MAP_CoreHabwOwner_EOAttachment_A_9-4-2015.pdf

Montana Natural Heritage Program (MNHP). 2017. Results of June 3, 2017 data request for AM5 Permit Area.

Montana Sage Grouse Oversight Team (MSGOT). 2016. Agenda item brief sheet: Agenda Item: Cloud Peak Energy proposed haul road in Southeast Montana. Helena. December 6, 2016. Available online at: https://sagegrouse.mt.gov/documents/MSGOTArchive/2016/Notes_Handouts_MSGOT_Dec_6_2016.pdf

National Cooperative Highway Research Program (NCHRP). 2008. Evaluation of the Use and Effectiveness of Wildlife Crossings. Report 615. 161 pp.

Natural Resources Conservation Service (NRCS). 2003. Ecological Site Descriptions (Technical Guides) for Major Land Resource Area 58A-Northern Rolling High Plains, North Part, Montana. USDA NRCS, June, 2003.Accessed January 23, 2018. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051409.pdf

Natural Resources Conservation Service (NRCS). 2006. Montana Rangeland Ecological Site Key and Brief Descriptions. Montana Supplement to National Range and Pasture Handbook. Accessed January 23, 2018: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_052469.pdf

Natural Resources Conservation Service (NRCS). 2012. Soil Survey Geographic (SSURGO) Database for Big Horn County Area, Montana. Version 8. Survey

MT-607. Available online at http://soildatamart.nrcs.usda.gov . Accessed February, 2015.

Naugle, D.E., K. E. Doherty, B. L. Walker, M. J. Holloran, and H. E. Copeland. 2011. Energy Development and Greater Sage-Grouse. Pp 489-503 in S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Nicklin Earth and Water. 2017. *Appendix L: Probable Hydrologic Consequences Update.* Bozeman: Unpublished report.

OSMRE. 2016. *Spring Creek Mine, Environmental Assessment.* Electronic, Denver: Office of Surface Mining Reclamation and Enforcement Program Support Division.

Patricelli, G.L., J.L. Blickley, and S.L. Hooper. 2012. "The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections".

Peel, MC, Finlayson, BL, and Mcmahon, TA. 2007. "Hal Archives." *Updated world map of Koppen-Geiger climate classification.* October 11. Accessed May 22, 2017. https://hal.archives-ouvertes.fr/hal-00305098/document .

Rieber, M. and S. Lee Soo. 1977. Comparative Coal Transportation Costs: An Economic and Engineering Analysis of Truck, Belt, Rail, Barge and Coal Slurry and Pneumatic Pipelines. Center for Advanced Computation Document No. 223, prepared for Bureau of Mines, Department of the Interior and the Federal Energy Administration.

Schall, J.D., P.L. Thompson, S.M. Zerges, R.T. Kilgore, and J.L. Morris (2012) HDS-5: Hydraulic Design of Highway Culverts: Third Edition U.S. Department of Transportation, Federal Highway Administration Publication Number: HIF-12-026.

Schmitt, B. J. Staldine, K. Krogstad, and P. Gori. Final Technical Memorandum: Spring Creek AM5 Crossing Design for Perennial and Intermittent Streams, Internal DEQ Analysis. June 12, 2018. Montana Department of Environmental Quality, Helena.

Schuman, G.E. and T.C. Richmond, editors. Sagebrush Establishment on Mined Lands: Ecology and Research. Proceedings of Symposium, "Sagebrush

Establishment on Mined Lands," 2000 Billings Land Reclamation Symposium, March 20-24, 2000, Billings, MT

Schuman, Gerald E., Richard A. Olson , Kristene A. Partlow & Scott E. Belden (2010) Wildlife Impacts to Big Sagebrush on Reclaimed Mined Lands, Arid Land Research and Management, 24:2, 117-132, DOI: 10.1080/15324980903471811

Scow, K. 2017. Baseline vegetation inventory: arrowhead amendment area, Spring Creek coal mine. Original April 2015, minor changes completed January 2017. Westech Environmental Services, Inc. Helena, Montana.

Slagle, Steven E. 1983. *Hydrology of Area 49, Northern Great Plains and Rocky Mountain Coal Provinces, Montana and Wyoming.* U.S. Geological Survey Water-Resources Investigations Open-File Report 82-682, Helena: U.S. Geological Survey.

Slagle, Steven E., Barney D. Lewis, and Roger W. Lee. 1985. *Ground-Water Resources and Potential Hydrologic Effects of Surface Coal Mining in the Northern Powder River Basin, Southeastern Montana. U.S. Geological Survey Water-Supply Paper 2239.* Washington: U.S. Government Printing Office.

Spring Creek Coal, LLC. (2015). *Surface Mining Permit No. C1979012, APPAM5, Arrowhead Amendment.* Decker.

Spring Creek Coal, LLC. n.d. "DNRC Dry Creek Commercial Lease Proposal, Environmental Supporting Data."

Spring Creek Mine (SCM). (2017). Reclamation Plan.

SCM. 2015. Appendix K, Exhibit 1, Hydrologic Control Plan (during mining) 17.2 4.305 (1) (O) & (T). 10/1/2015. Spring Creek Mine. Arrowhead amendment.

Stagliano 2011. Baseline assessment for fish, macroinvertebrates, and herpetofauna in the headwaters of Otter and Hanging Woman Creeks within the Tongue River basin. Prepared for the BLM Miles City Office. Montana Natural Heritage Program, Helena.

Stagliano. D. 2015. Spring Creek Mine 2015 expanded monitoring area baseline aquatic survey and assessment of fish, macroinvertebrates, and amphibians in Big Horn County, Montana. Prepared for Cloud Peak Energy Resources.

State of Montana. 2015. Office of the Governor, Executive Order 12-2015. Executive Order Amending and Providing for Implementation of the Montana Sage-grouse Conservation Strategy.

Stevens, B. E., D. E. Naugle, B. Dennis, J. W. Connelly, T. Griffiths, and K. Reese. 2013. Mapping Sage-Grouse Fence-Collision Risk: Spatially Explicit Models for Targeting Conservation Implementation. Wildlife Society Bulletin 37(2):409-415.

Stubbs, Donna, 2014. Class III Cultural Resource Survey of State Section 16, T9S, R39E for the Cloud Peak Energy Haul Road in Big Horn County, Montana. Report prepared for Cloud Peak Energy, Gillette, Wyoming. By ACR Consultants, Inc., Sheridan, Wyoming.

Stubbs, Donna, 2015. Class III Cultural Resource Survey for the Cloud Peak Energy, Spring Creek Coal, Arrowhead Amendment Haul Road, Private Land Portion, in Big Horn County, Montana. Report prepared for Cloud Peak Energy, Gillette, Wyoming. By ACR Consultants, Inc., Sheridan, Wyoming.

Thunder Basin Grasslands Prairie Ecosystem Association (TBGPEA). 2017. Arrowhead LLC. Certificate of Participation-Certificate of Inclusion (CI/CP). Attachment 4. CI/CP Application. July 10, 2017. 88 p.

Thunderbird Wildlife Consulting, Inc. (TWC). 2015. Spring Creek Mine 2014 Wildlife Monitoring and Baseline Inventories. Prepared for Cloud Peak Energy Resources LLC; Spring Creek Mine. March 2015.

TWC 2016. Spring Creek Mine 2015 Wildlife Monitoring. Prepared for Cloud Peak Energy Resources LLC; Spring Creek Mine. March 2016.

U.S. Environmental Protection Agency (EPA). 1978. Protective Noise Levels, Condensed Version of EPA Levels Document. EPA 550/9-79-100 (N-96-01 II-A-86).

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetland Delineation Manual. Wetlands Research Program Technical Report Y-87-1. Vicksburg, MS,

U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Bureau of Economic Analysis. 2016. Big Horn County Business Summary. Accessed on May 31, 2017. Retrieved from http://doc.arcgis.com/en/business-analyst/ .

U.S. Department of Transportation (USDOT). 2006. FHWA Roadway Construction Model User's Guide. FHWA-HEP-05-054. DOT-VNTSC-FHWA-05-01.

U.S. Department of Transportation (USDOT). 2007. FHWA Mitigation Strategies for Design Exceptions- Safety Guide. Chapter 3. Lane Widths. Accessed on December 28, 2017. https://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/

U.S. Fish and Wildlife Service. 2013. Recovery plan for the black-footed ferret (Mustela
nigripes). U.S. Fish and Wildlife Service, Denver, Colorado. 157 pp.

United States Department of Transportation Federal Highway Administration (DOT-FHWA). 2010. Culvert design for aquatic organism passage. Hydraulic Engineering Circular No. 26, First Edition. Publication No. FHWA-HIF-11-008.

United States Department of Transportation Federal Highway Administration (DOT-FHWA). 2011. Wildlife Crossing Structure Handbook-Design and Evaluation in North America. Publication No. FHWA-CFL/TD-11-003.

United States Fish and Wildlife Service (USFWS). 2017. Threatened and Endangered Species in Big Horn County, MT. Accessed at: https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=30003

US Army Corps of Engineers. 2017. Public Notice: 30-day notice for Application No. NOW-2009-00654 covering Youngs Creek Mining Company, LLC. Joint Notice of Permit Pending: Wyoming Department of Environmental Quality and Montana Department of Environmental Quality. Issued January 12, 2017. Cheyenne, Wyoming.

US Census Bureau. 2010. Big Horn County Census 2010 Census Profile. Accessed on May 31, 2017. Retrieved from http://doc.arcgis.com/en/business-analyst/ .

US Census Bureau. 2016. A Profile of Socioeconomic Measurements: Big Horn County Population Trends, 1970-2016 . Accessed on May 31, 2017 Retrieved from https://headwaterseconomics.org/tools/economic-profile-system/about/

US Department of Agriculture (USDA). (2012). Soil Survey of the Big Horn County Area, Montana. NRCS On-line soil survey MT-607. Soul data and Map updated February 2012.

USDA. 2016. Web Soil Survey. August 10. Accessed June 16, 2017. https://websoilsurvey.nrcs.usda.gov/app/ .

USDA. 2017. National Soil Survey Handbook. Lincoln: March.

US Forest Service (USFS). 2017. Aquatic Organism Passage: FishXing. Available online at: https://www.fs.fed.us/biology/nsaec/fishxing/ accessed on December 20, 2017.

Ver Ploeg, A. J., DeBruin, R. H., & Jones, R. W. 2008. Chapter 1: Geology and Geography. In D. A. Copeland, & M. L. Ewald, Water Associated with Coal Beds in Wyoming's Powder River Basin: Geology, Hydrology, and Water Quality - Wyoming State Geological Survey Exploration Memoir No. 2. Laramie: Wyoming State Geological Survey.

Vuke, S. M., E. L. Heffern, R. N. Bergantino, and R. B. Colton. 2007. Geologic Map of the Birney 30' x 60' Quadrangle, Eastern Montana - Montana Bureau of Mines and Geology Open File 431. Butte: Montana Bureau of Mines and Geology.

Walker, B. L., and D. E. Naugle. 2011. West Nile virus ecology in sagebrush habitat and impacts on Greater Sage-Grouse populations. Pp 127-142 *in* S. T. Knick and J. W. Connelly (editors). Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkley, CA.

Walker, B. L., D. E. Naugle, K. E. Doherty. 2006. Greater Sage-Grouse Population Response to Energy Development and Habitat Loss. Journal of Wildlife Management 71(8):2644-2654.

Westech Environmental Services Inc. (2015). Arrowhead Amendment Area, Spring Creek Coal Mine. Baseline Soil Survey. Appendix A3. October.

Western Regional Climate Center. 2017. Average Wind Speed 1996-2006. Accessed May 22, 2017. http://www.wrcc.dri.edu/htmlfiles/westwind.final.html#MONTANA .

Wilmoth, S. 2017. Scoping Spring Creek Transportation Corridor AM5. Letter to C. Jones. Montana Historical Society, Helena.

WRCC. 2017. Sheridan Field Station, Wyoming (488160), Period of Record Monthly Climate Summary. Accessed May 22, 2017. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wyshfs

Zouhar, K. 2003. Bromus tectorum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/graminoid/brotec/all.html [2017, August 28].

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