A9.0 HYDROLOGY AND WATER QUALITY

A9.1 PROPOSED ACTION

A9.1.1 Construction

There are four areas of potential hydrologic impact from construction of the proposed rail line. These are: (1) effects of increased erosion and resultant increases in sediment load during construction; (2) changes in surface drainage patterns and/or aquifer recharge; (3) impacts from bridge construction, rip-rapping, and placement of culverts on streams; and (4) impacts from construction on flood-prone areas. Generally, construction impacts to the area's hydrologic balance would be short term, although some long term impacts could occur from improperly constructed culverts or bridges.

Construction of the proposed rail line would have little effect on the quantity of water in the Tongue River or Otter Creek. However, the quality of surface and ground water in the Tongue River/Otter Creek area could be affected.

A9.1.1.1 Sediment Load

The major short term hydrologic impact to project area streams would be from increased soil erosion caused by the construction of the railroad. Construction of the railroad subgrade would involve the removal of the existing topsoil and vegetative cover. Conventional cut and fill earthwork exposes the underlying soil material to increased wind and water erosion, the effects of which would remain until the roadbed is stabilized with mulch or new vegetation. Impacts to the area's surface water system are directly proportional to the amount of additional eroded material that finds its way into a stream.

Construction of the Tongue River Railroad Company's railroad could increase both the wash load and bed material load of area streams.[1] Changes in the bed material load could be caused in two ways. The addition of sediment in the size range of the channel bed during construction of river and stream crossings would increase the bed material load. The effect might be to exceed the transport capacity of the channel in a particular reach, with the result that the added sediment would be deposited a short distance downstream. This impact would be short term, since bed material would be deposited in the channel and it would not have a significant adverse impact on water quality. Changes in bed material load also could be caused by altering the transport capacity of the channel itself. Improperly sized or installed culverts could change a stream's transport capacity. The effect of this change is discussed in section A9.1.1.3.

An increase in the wash load would affect directly a stream's water quality. The parameter normally used to quantify such an impact is Total Suspended Solids (TSS). An estimate of the increases in TSS

is derived by employing the U.S. Department of Agriculture's Universal Soil Loss Equation (USLE).[2] The estimated gross erosion for the proposed rail line, as discussed in section A8.1.1.2, Table A8-1, is 67,500 tons per acre/year.

Not all of the soil erosion caused by construction of the railroad would find its way into a stream system. Slopes would be abruptly reduced at the toe of cuts and fills; drainage ditches at the toe of cut slopes would have gradients approximating those of the railroad grade. In addition, runoff would be overland at the toe of fill slopes, resulting in low velocities. The decrease in gradient at the toes of cut and fill slopes and a resulting decrease in velocity of the water would cause most of the eroded material to be deposited at the toe of the slope.

Some of the material transported to a stream system would be deposited on flood plains as alluvium or channel splays. Other materials may be deposited in the form of bar materials in the channels. This deposition may affect the respective channels in their ability to transport subsequent runoff events. However, it would not affect water quality per se.

The normal sediment delivery ratio for the Tongue River Basin is 6 percent; however, it does range as high as 8 percent.[3] Using the high range of 8 percent and gross erosion estimates, the increased sediment load to the Tongue River drainage system from construction of the proposed rail line with the Ashland SE Alignment would be approximately 5,400 tons per year. This eroded soil material would increase the TSS level of the Tongue River and Otter Creek by roughly 12 milligrams per litre (mg/l) and 19 mg/l, respectively (see Table A9-1). Should the proposed rail line follow the Ashland NW Alignment, the increased sediment load to the Tongue River would be about 4,500 tons per year. The TSS level of the Tongue River would increase by approximately 10 mg/l, and the TSS level of Otter Creek would increase by roughly 19 mg/l.

TSS levels fluctuate greatly in the area's streams. TSS concentrations in the Tongue River at Miles City range from 5 mg/l in October and November to 1,200 mg/l during spring runoff periods. A comparative range for Otter Creek is between 10 and 500 mg/l.[4] It is during the high flow periods that sediment eroded from the proposed rail line would most likely wash into area streams. This would occur at times when TSS concentrations in the streams would be at their highest levels. Therefore, railroad construction would cause small increases in sediment loads and TSS in area streams. The resulting increase in TSS concentrations would not alter the suitability of water for existing uses (irrigation, stock and wildlife water, fishing), and therefore Montana water quality standards would not be violated.[5]

TABLE A9-1

AVERAGE SHORT TERM INCREASE IN TOTAL SUSPENDED SOLIDS (TSS)
PROPOSED ACTION

FACTOR	ASHLAND SE ALIGNMENT	ASHLAND NW ALIGNMENT
Increase in Sediment Load to Stream (tons/year)[a]	5,400	4,500
Increase in TSS (mg/l):[b]		
Tongue River	12	10
Otter Creek	19	19

[a] Gross water erosion times 8 percent (delivery ratio).
[b] Assumes mean annual flows of 328,900 acre-feet (af) for Tongue River at Miles City; 19,000 AF for Otter Creek at Ashland.

A9.1.1.2 Surface Drainage Patterns and Aquifers

Construction of the proposed rail line should not significantly affect surface drainage patterns. The installation of properly sized culverts and the maintenance of those culverts by clearing debris would allow water to follow its normal course. It is possible that the construction of the railroad would cause some water to accumulate at the toes of cut and fill slopes. However, the construction of simple ditches at such points would effectively allow water to drain into the appropriate stream.

Impacts to ground water aquifers from construction of the rail line are likely to be minimal. Depths from the surface to the first significant water-bearing zone are least in the stream valleys (alluvial areas, 10-25 feet), and increase at a distance from the valleys (60-90 feet).[6] Since most valley areas will require fill, as opposed to cuts, excavation should be limited to removing topsoil and vegetation. Cut areas are generally in the hilly, nonvalley regions and should be limited to between 10 and 25 feet. Only rarely does a cut exceed 35 feet. Since the depth to ground water in nonvalley areas generally is greater than 35 feet, no impact to ground water is expected to occur from the construction of the proposed rail line.

All perennial streams in the study area are local ground water discharge points.[7] Therefore, if for any reason an excavation is required in an alluvial area, any effects would be limited to the immediate locale. There would be no effect on ground water quality or quantity in the shallow alluvial aquifers.

A9.1.1.3 Bridge and Culvert Construction

The proposed rail line would require the placement of numerous culverts across ephemeral and intermittent streams, and the construction of bridges across the Tongue River, Paddy Fay Creek, and at two points on Otter Creek. The Ashland NW Alignment would require one crossing on Otter Creek, nearer in location to the Tongue River than the crossing of the Ashland SE Alignment.

Short and long term impacts to water quality can occur from the improper selection and placement of culverts across intermittent streams. Selection of a culvert with too small a diameter, placement of the culvert in a stream during periods of flow, and failure to adequately stabilize fill slopes could result in short term impacts to the water quality. The TRRC would select culverts ranging in diameter size from 30 inches to 200 inches, depending upon the size of streams and upon heights of fill (see Table A9-2). The culverts would be of sufficient size to withstand a 100-year flood event and would be installed during times of no or minimal streamflow, thus reducing the chance of increasing TSS in the stream. Moreover, stream banks adjacent to culverts would be seeded and mulched in order to stabilize slopes as rapidly as possible and thereby to reduce soil erosion. In some cases, the use of rip-rap may be necessary to ensure stabilization. These measures should reduce the likelihood of serious impacts to water quality at stream crossings. However, improper placement of culverts during the construction phase of the project could create a condition whereby the sediment transport capacity of a particular reach of stream was altered. This situation, called "nonequilibrium", would have a long term impact on water quality.

Both the Tongue River and Otter Creek have average annual stream discharge of more than 5 cubic feet per second (cf/s). Dredged material associated with placing bridge piers at the Tongue River crossing and fill material required at the Tongue River and Otter Creek crossings will necessitate permits under Section 404 of the Federal Water Pollution Control Act (P.L. 92-500). These permits will be applied for. In addition, the U.S. Army Corps of Engineers will be reviewing the TRRC EIS as a cooperating agency. Likewise, three areas requiring rip-rap for channel stabilization in excess of 500 feet in length will require permits under Section 404.

Construction of a bridge across the Tongue River and the bridges across Otter Creek may cause some temporary increases in TSS concentrations. Channel work during periods of high flow (spring runoff) is dangerous. Therefore, most work would have to be done during lower flow periods, when natural TSS concentrations are lower. Temporary TSS concentrations could be significant during construction of the bridges, but the impact could be mitigated partially by expediting the work.

TABLE A9-2

STREAM-CROSSING CONSTRUCTION FOR THE PROPOSED ACTION

STREAM NAME[a]	TYPE OF STREAM-CROSSING STRUCTURE	STREAM NAME	TYPE OF STREAM-CROSSING STRUCTURE
Yellowstone River	n/a[b]	Cook Creek	30" CMP
Moon Creek	n/a	East Fork Otter Creek	3-120" CMP
Paddy Fay Creek	Bridge	Home Creek	3-120" CMP
Wolf Creek	126" CMP[c]	Willow Creek	60" CMP
Circle Creek	114" CMP	Otter Creek	Bridge
Thorpe Creek	120" CMP	Spring Creek	78" CMP
Kennedy Creek	96" CMP	Bridge Creek	84" CMP
Plunket Creek	90" CMP	Bowman Creek	60" CMP
Geddes Creek	90" CMP	King Creek	114" CMP
Yank Creek	96" CMP	Pumpkin Creek	n/a
Miles Creek	114" CMP	Dry Creek	n/a
Forest Creek	204" CMP	Prat Creek	n/a
Horse Creek	126" CMP	Nelson Creek	n/a
Six Mile Creek	204" CMP	Ash Creek	n/a
Miller Creek	156" CMP	Dry Creek	n/a
Pump Creek	90" CMP	Cheever Creek	n/a
Cow Creek	156" CMP	Sand Creek	n/a
Ranch Creek	114" CMP	Foster Creek	n/a
Coal Creek	108" CMP	Stony Creek	n/a
Cottonwood Creek	126" CMP	Elk Creek	n/a
Dry Creek	108" CMP	Lay Creek	n/a
Trail Creek	96" CMP	Coon Creek	n/a
Alfalfa Creek	96" CMP	Garden Creek	n/a
Hurt Creek	114" CMP	Liscom Creek	n/a
Joe Leg Creek	120" CMP	Big John Creek	n/a
Hammond Draw	90" CMP	Freda Creek	n/a
S. Fork Cow Draw	n/a	Goodale Creek	n/a
Rosebud Creek	n/a	Straight Creek	n/a
Greenleaf Creek	n/a	Diamond R Creek	n/a
Roe & Cooper Creek	120" CMP	Beaver Creek	n/a
Tongue River	Bridge	Houston Draw	n/a
Colbert Coulee	84" CMP	Bringoff Creek	n/a
Double E Coulee	96" CMP		

[a] Stream names are in downstream-to-upstream order crossed by the proposed rail line

[b] n/a indicates that the stream is not crossed

[c] CMP = corrugated metal pipe culvert used for stream crossing

A9.1.1.4 Impacts to Flood-prone Areas

The proposed rail line would encroach on some flood-prone areas as defined in the Yellowstone-Tongue Area-wide Planning Organization 208 study (1978) and the Custer County Unincorporated Area Flood Hazard Boundary Map (June 26, 1979).[8] Consistent with Executive Order 11988 and the Department of Transportation Order 5650.2, these encroachments have been reviewed for their potential impacts to human life, property, transportation and natural and beneficial flood plain values.

The only encroachments that may be considered potentially significant for the proposed rail line with either Ashland alignment would be the previously noted river and stream crossings (Tongue River and Otter Creek). Assuming that the river crossings are properly designed, they should not significantly alter the 100-year flood plain.

Encroachments on the flood plain should not cause additional threat to human life from flood waters. Disruptions to transportation would occur only to TRRC trains should the 100-year flood event destroy part of the railroad. Existing transportation systems should not be additionally threatened. Provision of proper flow capacity would ensure that bridges do not affect the natural moderation of flood flows. Other than short term increases in suspended sediment and turbidity, the crossings should not affect water quality or aquatic life. Bridge construction is not expected to result in adverse impacts to ground water recharge, wildlife, open space, scientific study, outdoor recreation, agriculture, aquaculture, or forestry within the designated flood plains.

A9.1.2 Operation and Maintenance

During operation and maintenance activities, it is possible that diesel fuel, coal, or herbicides would be spilled into streams. Fueling of locomotives is expected to be done at the Miles City service yards, and not at any point along the TRRC route. A contingency plan will be developed to minimize impacts should a spill occur in the yards. Therefore, diesel fuel should be spilled only in the relatively rare occurrence of a derailment (see section A7.1.2.2 for a discussion of possible derailments). Coal will be hauled on unit trains, meaning that, once loaded, it would not be rehandled within the project area. Coal spills also would occur only in the event of a derailment. During the early years of operation, control of noxious weeds will be required along the railroad right-of-way. Spraying adjacent to streams creates the possibility that overspraying or wind drift could introduce the spray (most likey 2,4-D) into a stream. There also is the possibility of a spill of this substance.

Should a derailment or a herbicide spill occur near a stream, and should diesel fuel, coal, or the herbicide make its way into the water, water quality would be temporarily impacted. Number 2 diesel fuel, being lighter than water, would coat and destroy plankton, while water soluable fractions would be toxic to aquatic life. Considering

travel time, the effects of a floating or dissolved substance would be removed from the project area within 1 week. However, possibly a year or more would be required for aquatic flora and fauna to regenerate. If coal were spilled directly into a stream, it would remain in place until removed by clean-up activities or transported downstream as part of the stream's sediment load during successive flood events. Chemical water quality would not be significantly affected, but the coal could interfere with activities such as fish spawning in the Tongue River if it occurred in a shallow area used as a spawning bed. Normal overspraying and wind drift should not introduce herbicides into a water body in amounts that would be toxic to aquatic biota. Toxic levels of certain substances would occur in the immediate vicinity of a spill, but would be quickly dispersed due to the high water soluability of 2,4-D and natural mixing in the stream.

The State of Montana has a Hazardous Material Response Plan. In the event of a spill of coal, fuel, or herbicide, the TRRC would immediate call a designated telephone number in Helena, Montana, to initiate emergency measures under this plan.

A9.1.3 Related Actions

Primary hydrologic impacts associated with the Tongue River Railroad would result not from the railroad itself but from the coal mines that would be served by the railroad. Since hydrologic impacts are extremely site specific, it is difficult to discuss with any precision the cumulative hydrologic impacts of a number of mines for which site specific studies have not been completed.

A9.1.3.1 Surface Water Impacts

The existing state and federal regulatory framework governing surface coal mining dictates that coal mines will have little direct impact on surface waters. Primary components of this framework include the Federal Surface Mining Control and Reclamation Act (SMCRA) of 1977 and the Montana Strip and Underground Mining Act, as amended. The SMCRA sets forth minimum environmental protection performance standards and provides that the individual states may regulate surface mining and reclamation provided that each state adopt laws at least as stringent as the federal laws and regulations. Montana is one of many states that has revised its surface coal regulations in order to achieve an approved program and primacy for surface coal mine regulation.

Montana's Permanent Program Strip and Underground Mine Reclamation Rules and Regulations were adopted on April 1, 1980. Montana surface mine regulations require that runoff from disturbed areas be captured in sedimentation ponds prior to release of the water. These sedimentation ponds must provide a theoretical detention time of 24 hours for the runoff from the 10-year, 24-hour storm. In addition, the ponds must provide a specified amount of space for sediment accumulation. Releases from the sedimentation ponds may not be made until the water

achieves established effluent criteria. The net effect of such regulations is to decrease the amount of surface runoff from the area above the ponds by the amount of water captured in the pond. Some of the water captured in sedimentation ponds will seep into the ground or be evaporated, and some would be used for dust control and other uses within the mine area. Thus, the water would be removed from the existing hydrologic balance of the area.

The unit area runoff in the project area is approximately 25 acre-feet per square mile per year.[9] Approximately 120 square miles would have to be removed from the drainage area of the Tongue River in order to reduce the mean annual flow at Miles City by 1 percent. Projections shown elsewhere indicate a disturbed area of less than 50 square miles for the high coal production scenario. Not all this acreage would be disturbed at one time. Thus, sediment control requirements should not cause significant impact to the flow of the Tongue River.

Ground water quality in the project area is expected to change as a result of the construction and the operation of five mines. Since the major streams in the area are ground water discharge zones, a change in ground water quality would cause a change in surface water quality. However, because ground water is a minor component of total streamflow, these effects would be minor. Changes in surface water quality as a result of mining, estimated by a mass balance equation as presented in the following section, will include a 10-percent increase in Total Dissolved Solids (TDS) concentrations in the Tongue River and a 24 to 77 percent increase in TDS concentrations in Otter Creek. These percentages are based on low flow conditions in the streams, and actual increases in average TDS could be much less. Even with this conservative estimate, surface water quality in the project area would be suitable for existing uses.

A9.1.3.2 Ground Water Impacts

The normal system involving ground water and surface water would be disrupted during mining on a very localized scale. For five mines, cumulative coal discharge losses to the Tongue River alluvium are estimated at 1.5 cf/s. This loss of inflow is equivalent to alluvial aquifer discharge to the river from 1.8 to 3.3 miles of river reach based on various reported discharge rates to the Tongue River (0.04 cf/s per mile to 0.85 cf/s per mile). The total effect on normal river flow (400 to 600 cf/s) of this decrease in ground water discharge would be extremely small.

After mining, it is expected that the contribution of the flow through the coal seams to the Tongue River and its alluvium would eventually recover to the same rates as those occurring prior to mining. Although the quantity of flows in the Tongue River alluvium and in the Tongue River itself would be similar to pre-mining conditions, the quality of water would be subject to significant change.

The following mass balance equation was used to compute potential water quality changes in the Tongue River:

$$C'_{all}\,(R_{clinker} + D_{spoils} + R_{all}) = (R_{clinker} \cdot C_{clinker}) + (D_{spoils} \cdot C_{spoils}) + (R_{all} \cdot C_{all})$$

where:

C'_{all} = the resultant TDS concentration of the alluvial ground water after receiving discharge from the affected mined area

C_{all} = the TDS concentration of direct recharge and deep aquifer discharge to the alluvium.

$C_{clinker}$ = the premining TDS concentration of clinker ground water

C_{spoils} = the resultant TDS concentration of ground water within the mine spoils

$R_{clinker}$ = the percent of flow discharged to the alluvium from direct recharge to the clinker

D_{spoils} = the percent of flow discharged to the alluvium that flows from the replaced mine spoils

R_{all} = the percent component of the flow of the alluvium that is derived from direct recharge and/or deep aquifer discharge

The equation is solved for C'_{all} using previously reported relative discharge contributions to the alluvium (0.04 to 0.85 cf/s per mile) and measured or calculated TDS concentrations, which are shown in Table A9-3.[10] Assumptions are that alluvial ground water underflow into the impacted area is zero; that ground water recharge from surface water sources into the impact area is zero; and that no chemical reactions occur downgradient from the spoil water outflow area.

Calculations show that TDS concentration of Tongue River alluvial ground water within the affected area is estimated to be 1,574 mg/l, or a 38 percent increase from pre-mining conditions. Although this is a significant change in TDS concentration, the degradation in quality would not reduce significantly the utility of this water for current uses. This is because the current quality exceeds EPA drinking water standards (500 mg/l), and specific conductance (1.4 times the predicted TDS) would be in the medium to high salinity hazard range--similar to current alluvial ground water.[11]

Since underflow is found to be insignificant in the Tongue River alluvial ground water system, all of the ground water moving into the alluvium quickly discharges into the Tongue River.[12] Therefore, cumulative impacts from five active mines would not increase the TDS concentration in downgradient alluvial ground water.

Impacts to the Otter Creek alluvium were estimated using a similar mass balance equation:

$$(Q_{si} \times C_{si}) + (Q_{ai} \times C_{ai}) + (Q_{bi} \times C_{bi}) = (Q_{so} \times C_{so}) + (Q_{ao} \times C_{ao})$$ [15]

TABLE A9-3

INPUT PARAMETERS TO ESTIMATE POST-MINING ALLUVIAL GROUND WATER QUALITY CHANGES

CHANGE FACTORS[a]	AMOUNT OF CHANGE
$C_{clinker}$[b]	300 mg/l
$C_{clinker}$[c]	6,000 mg/l
C_{all}[d]	1,151 mg/l
$R_{clinker}$[b]	0.13
D_{spoils}[b]	0.11
R_{all}[b]	0.76

[a] Refer to previous page for definition of abbreviations

[b] Calculated from data presented in Woessner et al., "Impacts of Coal Strip Mining on the Hydrogeologic System of the Northern Great Plains," Journal of Hydrology 43 (1979), pp. 445-467.

[c] From Van Voast et al., "Hydrologic Aspects of Strip Mining in the Subbituminous Coal Fields in Montana"

[d] Calculated from pre-mining steady-state mass balance equations using an alluvial ground water TDS concentration of 1,141 mg/l, in Woessner et al., "Impacts of Coal Strip Mining," Journal of Hydrology 43 (1979), pp. 445-467.

Where: C_{si} = Dissolved solids concentration of surface water recharging the alluvium
C_{ai} = Dissolved solids concentration of alluvial inflow.
C_{bi} = Dissolved solids concentration of bedrock inflow.
C_{so} = Dissolved solids concentration of alluvial ground water recharging Otter Creek at the end of the reach.
C_{ao} = Dissolved solids concentration of alluvial ground water leaving the reach.

The mass balance equation is solved for past mining C_{ao} using the following values:

Q_{si} = 2,271 acre-feet/year
C_{si} = 440 mg/l
Q_{ai} = 157 acre-feet/year
C_{ai} = 3,524 mg/l
Q_{bi} = 640 acre-feet/year
C_{bi} = 3,650 mg/l (after mining)
Q_{so} = 819 acre-feet/year
$C_{so} = C_{ao}$
Q_{ao} = 209 acre-feet/year

Solution of the mass balance equation demonstrates that salt loading from the spoils in the post-mining system would increase the average dissolved solids concentration of Otter Creek alluvial ground water (C_{ao}) by about 1,190 mg/l to 3,780 mg/l, or a 46-percent increase over existing conditions. In effect, the dilution of alluvial ground water from bedrock aquifer discharge that now exists would be

lost in the post-mining system. The average quality of ground water in the alluvium below the mined areas would more closely match upstream conditions. The alluvial ground water quality would remain suitable for livestock water, and therefore would maintain its use suitability classification.

Mining in the Otter Creek drainage could replace some existing recharge areas with relatively less permeable spoils, particularly if significant areas of scoria (clinker) are disturbed. Solution of the mass balance equation shows that a 10-percent decrease in spoil ground water flow (Q_{bi} in the mass balance equation) would result in approximately a 6-percent decrease in the predicted final ground water quality in the alluvium (C_{ao} in the equation). It should be noted that since clinker was formed by the combustion of coal, the clinker would be relatively undisturbed by mining.

The cumulative mining impacts on surface water quality (TDS) are a function of the number of active mines adjacent to the stream. The predicted quality of Tongue River water immediately below the impacted area of five mines is estimated at 544 mg/l TDS, for average minimum discharge of 200 cf/s and upstream baseflow TDS concentration of approximately 500 mg/l.[13] The following equation was used to calculate this post-mining surface water quality for five mine sites that would affect 10 miles of river reach, with an alluvial discharge of 0.85 cf/s per mile to the river:

$$C'_{river}\,(D_{river} + D_{all}) = (C_{river} \cdot D_{river}) + (D_{all} \cdot C'_{all})$$

where:

C'_{river} = the predicted post-mining TDS concentration of the river directly downstream from the downstream mine.
C_{river} = the baseflow TDS concentration of the river.
C'_{all} = the post-mining TDS concentration of the alluvial ground water.
D_{river} = the average annual minimum discharge.
D_{all} = the total discharge of alluvial groundwater that is affected by mining at the proposed five sites.

This predicted change in Tongue River water quality is viewed as a "worst case" situation because it was calculated using the highest reported discharge rate from the alluvium and a low flow rate of the Tongue River. The predicted post-mining Tongue River water would have less than a 10-percent increase in TDS, which is equivalent to ambient downstream increases in TDS caused by alluvial discharges through 17.5 miles of river reach under existing conditions.

Post-mining quality of Otter Creek water below the projected mines has been estimated for baseflow discharge (about 1 cf/s) and average annual discharge (about 8.7 cf/s) using the same procedure employed for the Tongue River. At Home Creek, near the downstream extent of projected mining, Otter Creek baseflow appears to be sustained entire-

ly by alluvial recharge augmented by discharge from bedrock aquifers. Accordingly, the post-mining solute concentration of Otter Creek in this reach would likely equal the predicted solute concentration of the alluvial ground water, or 3,780 mg/l. This value is 730 mg/l (24 percent) greater than the average baseflow concentrations observed near Home Creek, and 1,640 mg/l (77 percent) greater than those observed at the mouth of Otter Creek.[14]

Impacts to the average annual TDS concentration of Otter Creek would be less than baseflow discharge. From review of USGS water quality data for the Otter Creek gauging station at Ashland, the average annual TDS concentration is 2,500 mg/l. Solving the mass balance equation using a calculated alluvial ground water to stream discharge rate of 819 acre-feet per year (1.13 cf/s), an alluvial water TDS concentration of 3,780 mg/l, and the average stream discharge and TDS values yields a predicted post-mining TDS concentration of 2,670 mg/l for average stream discharge. This is approximately 170 mg/l (7 percent) greater than the estimated average pre-mining TDS concentration.

The average pre-mining TDS concentration in Otter Creek makes the water unsuitable for irrigation due to a high salinity hazard.[15] Therefore, the estimated 170 mg/l increase in average TDS after mining would not affect appreciably the present use of the water.

It should be noted that irrigation is feasible only during times when surface water runoff rates are high and TDS concentrations are low. Under such conditions, ground water discharge to the stream comprises a very minor component of stream flow, and an increase in ground water discharge TDS concentrations would be insignificant under such flow conditions.

In summary, because of the mitigative measures required by state and federal regulations during mining and reclamation phases, surface water and ground water flow regimes would be restored to pre-mining conditions. Although quality changes in the spoil ground waters would be significant, with resultant TDS increases in down-gradient alluvial ground waters of 38 percent (1,151 to 1,574 mg/l) in the Tongue River and up to 46 percent in Otter Creek, the alluvial ground water away from the mining area would not be impacted. Additionally, baseflow changes in Tongue River TDS are estimated to increase less than 10 percent from pre-mining conditions. Baseflow changes in Otter Creek TDS are estimated to increase by 24 and 77 percent at Home Creek and at the mouth of the stream, respectively. These changes would not change the current use suitability classifications of either stream.

A9.2 TONGUE RIVER ROAD ALTERNATIVE

A9.2.1 Construction

Construction of the Tongue River Road alternative with the Ashland SE Alignment would impact approximately 1,287 acres. Estimated gross erosion, as shown in section A8.2.1.2 (Table A8-6), is 71,200 tons/year. Sediment load and TSS levels in the Tongue River associated with this are shown in Table A9-4. If the Ashland NW Alignment were included, the figures for gross erosion, sediment load, and TSS levels would be less. As shown in the discussion of the proposed rail line, the lower figures can be attributed to the smaller cuts and the disturbance of less area with the Ashland NW Alignment.

TABLE A9-4

AVERAGE SHORT TERM INCREASE IN TOTAL SUSPENDED SOLIDS (TSS)
TONGUE RIVER ROAD ALTERNATIVE

FACTOR	ASHLAND SE ALIGNMENT	ASHLAND NW ALIGNMENT
Increase in Sediment Load to Stream (tons/year)[a]	5,700	4,800
Increase in TSS (mg/l):[b]		
Tongue River	13	11
Otter Creek	19	19

[a] Gross water erosion times 8 percent (delivery ratio)
[b] Assumes mean annual flow of 328,900 acre-feet (af) for Tongue River at Miles City; 19,000 AF for Otter Creek at Ashland

As shown in Table A9-5, the Tongue River Road alternative route involves crossing a number of different intermittent streams than those crossed by the proposed rail line. Crossings of these streams would be accomplished in the same manner as those on the route of the proposed rail line, and impacts should be little different than those expected for the proposed rail line. Surface drainage patterns should not be significantly altered. The hydrologic character of the Tongue River Road alternative route is similar to that of the proposed rail line and, therefore, ground water aquifers should not be impacted by construction.

Construction along the Tongue River Road alternative route would require an additional short span bridge across Pumpkin Creek. Earthwork along Pumpkin Creek might temporarily increase TSS downstream from the stream crossing.

TABLE A9-5

STREAM-CROSSING CONSTRUCTION FOR THE TONGUE RIVER ROAD ALTERNATIVE

STREAM NAME[a]	TYPES OF STREAM-CROSSING STRUCTURES	STREAM NAME	TYPES OF STREAM-CROSSING STRUCTURES
Yellowstone River	n/a[b]	Cook Creek	n/a
Moon Creek	n/a	East Fork Otter Creek	3-120" CMP[c,d]
Paddy Fay Creek	Bridge[c]	Home Creek	3-120" CMP[c]
Wolf Creek	n/a	Willow Creek	60" CMP[c]
Circle Creek	n/a	Otter Creek	.ridge[c]
Thorpe Creek	n/a	Spring Creek	n/a
Kennedy Creek	n/a	Bridge Creek	n/a
Plunket Creek	n/a	Bowman Creek	n/a
Geddes Creek	n/a	King Creek	n/a
Yank Creek	n/a	Pumpkin Creek	Bridge
Miles Creek	n/a	Dry Creek	108" CMP
Forest Creek	n/a	Prat Creek	144" CMP
Horse Creek	n/a	Nelson Creek	144" CMP
Six Mile Creek	n/a	Ash Creek	180" CMP
Miller Creek	n/a	Dry Creek	72" CMP
Pump Creek	n/a	Cheever Creek	66" CMP
Cow Creek	n/a	Sand Creek	84" CMP
Ranch Creek	n/a	Foster Creek	2-144" CMP
Coal Creek	n/a	Stony Creek	66" CMP
Cottonwood Creek	n/a	Elk Creek	84" CMP
Dry Creek	n/a	Lay Creek	168" CMP
Trail Creek	n/a	Coon Creek	108" CMP
Alfalfa Creek	n/a	Garden Creek	96" CMP
Hurt Creek	n/a	Liscom Creek	180" CMP
Joe Leg Creek	n/a	Big John Creek	84" CMP
Hammond Draw	n/a	Freda Creek	84" CMP
S. Fork Cow Draw	n/a	Goodale Creek	108" CMP
Rosebud Creek	n/a	Straight Creek	72" CMP
Greenleaf Creek	n/a	Diamond R Creek	96" CMP
Roe & Cooper Creek	n/a	Beaver Creek	2-144" CMP
Tongue River	Bridge	Houston Draw	90" CMP
Colbert Coulee	n/a	Bringoff Creek	108" CMP
Double E Coulee	n/a		

[a] The names of streams are in downstream to upstream order crossed by the Tongue River Road alternative route

[b] n/a indicates that the stream is not crossed

[c] Crossing structure is the same as for the proposed rail line

[d] CMP = corrugated metal pipe culvert used for stream crossing

The Tongue River Road alternative route would impact a flood-prone area adjacent to the Tongue River, further downstream than would the proposed rail line. The crossing of the Tongue River near Pumpkin Creek would cross a flood-prone area, but proper design of the bridge should not cause a significant alteration of the 100-year flood plain.

A9.2.2 Operation and Maintenance

Operation and maintenance impacts of a railroad over the Tongue River Road alternative route would be essentially the same as for one over the route of the proposed rail line. Impacts to water quality from fuel, coal, and chemical spills would be similar in either case.

A9.2.3 Related Actions

The Tongue River Road alternative would serve the same potential coal mines as would the proposed rail line. Impacts to hydrologic resources would be the same in either case.

A9.3 MOON CREEK ALTERNATIVE

A9.3.1 Construction

Construction of the Moon Creek alternative with the Ashland SE Alignment would impact 1,146 acres. Estimated gross erosion, as shown in section A8.3.1.2 Table A8-8), is 72,100 tons/year. Sediment load and TSS levels in the Tongue River associated with this, and the figures including the Ashland NW Alignment, are shown in Table A9-6.

TABLE A9-6

AVERAGE SHORT TERM INCREASE IN TOTAL SUSPENDED SOLIDS (TSS)
MOON CREEK ALTERNATIVE

FACTOR	ASHLAND SE ALIGNMENT	ASHLAND NW ALIGNMENT
Increase in Sediment Load to Stream (tons/year)[a]	5,800	4,900
Increase in TSS (mg/l):[b]		
Tongue River	13	19
Otter Creek	11	18

[a] Gross water erosion times 8 percent (delivery ratio)
[b] Assumes mean annual flow of 328,900 acre-feet (af) for Tongue River at Miles City; 19,000 AF for Otter Creek at Ashland

As shown in Table A9-7, the Moon Creek alternative involves crossing many of the same intermittent streams as the proposed rail line. Crossings of these streams would be accomplished in the same manner as those on the route of the proposed rail line and anticipated impacts should not differ. The hydrologic character of the Moon Creek alternative route is similar to that of the proposed rail line and, therefore, ground water aquifers should not be impacted by construction.

The Moon Creek alternative differs from the proposed rail line, however, in that it would necessitate construction of a super span bridge across the Yellowstone River approximately 8 miles west of Miles City, and it would require rehabilitation of an existing railroad bridge on the outskirts of that community. Construction of the new bridge across the Yellowstone River is likely to cause significant temporary increases in TSS.

A9.3.2 Operation and Maintenance

Operation and maintenance impacts of a railroad over the Moon Creek alternative route would be essentially the same as for one over the route of the proposed rail line. Impacts to water quality from fuel, coal, and chemical spills would be similar in either case, although the significance of those impacts could increase in magnitude should the Yellowstone River be directly affected.

A9.3.3 Related Actions

The Moon Creek alternative would serve the same potential coal mines as would the proposed rail line. Impacts to hydrologic resources would be the same in either case.

TABLE A9-7

STREAM-CROSSING CONSTRUCTION FOR THE MOON CREEK ALTERNATIVE

STREAM NAME[a]	TYPES OF STREAM-CROSSING STRUCTURES	STREAM NAME	TYPES OF STREAM-CROSSING STRUCTURES
Yellowstone River	Bridge	Cook Creek	30" CMP[e]
Moon Creek[b]	(2) 144" CMP and 180" CMP	East Fork Otter Creek	3-120" CMP[e]
		Home Creek	3-120" CMP[e]
Paddy Fay Creek	n/a[d]	Willow Creek	60" CMP[e]
Wolf Creek	n/a	Otter Creek	Bridge[e]
Circle Creek	n/a	Spring Creek	78" CMP[e]
Thorpe Creek	120" CMP[e]	Bridge Creek	84" CMP[e]
Kennedy Creek	96" CMP[e]	Bowman Creek	60" CMP[e]
Plunket Creek	90" CMP[e]	King Creek	114" CMP[e]
Geddes Creek	90" CMP[e]	Pumpkin Creek	n/a
Yank Creek	96" CMP[e]	Dry Creek	n/a
Miles Creek	114" CMP[e]	Prat Creek	n/a
Forest Creek	204" CMP[e]	Nelson Creek	n/a
Horse Creek	126" CMP[e]	Ash Creek	n/a
Six Mile Creek	204" CMP[e]	Dry Creek	n/a
Miller Creek	156" CMP[e]	Cheever Creek	n/a
Pump Creek	90" CMP[e]	Sand Creek	n/a
Cow Creek	156" CMP[e]	Foster Creek	n/a
Ranch Creek	114" CMP[e]	Stony Creek	n/a
Coal Creek	108" CMP[e]	Elk Creek	n/a
Cottonwood Creek	126" CMP[e]	Lay Creek	n/a
Dry Creek	108" CMP[e]	Coon Creek	n/a
Trail Creek	96" CMP[e]	Garden Creek	n/a
Alfalfa Creek	96" CMP[e]	Liscom Creek	n/a
Hurt Creek	114" CMP[e]	Big John Creek	n/a
Joe Leg Creek	120" CMP[e]	Freda Creek	n/a
Hammond Draw	90" CMP[e]	Goodale Creek	n/a
S. Fork Cow Draw	n/a	Straight Creek	n/a
Rosebud Creek	n/a	Diamond R Creek	n/a
Greenleaf Creek	n/a	Beaver Creek	n/a
Roe & Cooper Creek	120" CMP[e]	Houston Draw	n/a
Tongue River	Bridge[e]	Bringoff Creek	n/a
Colbert Coulee	84" CMP[e]		
Double E Coulee	96" CMP[e]		

[a] Stream names are in downstream to upstream order crossed by the Moon Creek alternative route

[b] Includes two crossings of Moon Creek

[c] CMP = corrugated metal pipe culvert used for stream crossing

[d] n/a indicates that the stream is not crossed

[e] Crossing structure is the same as for the proposed rail line

A9.4 COLSTRIP ALTERNATIVE

A9.4.1 Construction

Construction of the Colstrip alternative with the Ashland SE Alignment would impact roughly 624 acres. Gross erosion estimates are presented in section A8.4.1.2, Table A8-10. The anticipated increase in sediment load is presented in Table A9-8. Much of the Colstrip alternative route does not lie in the Tongue River drainage. Consequently, TSS increases in the Tongue River would be lower for this alternative than for the proposed rail line. The inclusion of the Ashland NW Alignment also would result in decreases in gross erosion, sediment load, and TSS levels. The lower figures would reflect the fact that the NW Alignment requires smaller cuts and disturbs slightly less area. However, Rosebud Creek would be affected on this route, while it would not be impacted by the proposed rail line. TSS levels in that stream could be expected to increase by 15 mg/l. Normal TSS levels in Rosebud Creek range from 50 mg/l to 1,000 mg/l. TSS is highest during the spring runoff when most erosion occurs, and a 15 mg/l increase at that time should have little impact on water quality.

TABLE A9-8

AVERAGE SHORT TERM INCREASE IN TOTAL SUSPENDED SOLIDS (TSS)
COLSTRIP ALTERNATIVE

FACTOR	ASHLAND SE ALIGNMENT	ASHLAND NW ALIGNMENT
Increase in Sediment Load to Stream (tons/year)[a]	2,800[b]	1,900
Increase in TSS (mg/l)[c]		
Tongue River	4	2
Otter Creek	19	19
Rosebud Creek	15	15

[a] Gross water erosion times 8 percent (delivery ratio)
[b] Assumes 0.66 percent accrues to Tongue River; 0.33 to Rosebud Creek
[c] Assumes mean annual flow of 328,900 acre-feet (af) for Tongue River at Miles City; 19,000 AF for Otter Creek at Ashland

Construction of a rail line along the Colstrip alternative route would cross fewer streams than either the proposed rail line or the other alternatives (see Table A9-9). Crossings of intermittent streams with culverts would be accomplished in the same manner as would the proposed rail line. Given the same constraints in construction that are applicable to the proposed rail line, surface drainage patterns should not be altered significantly. The hydrologic character of the Colstrip alternative route is similar to that of the pro-

TABLE A9-9

STREAM-CROSSING CONSTRUCTION FOR THE COLSTRIP ALTERNATIVE

STREAM NAME[a]	TYPES OF STREAM-CROSSING STRUCTURES	STREAM NAME	TYPES OF STREAM-CROSSING STRUCTURES
Yellowstone River	n/a[b]	Cook Creek	30" CMP[d]
Moon Creek	n/a	East Fork Otter Creek	3-120" CMP[d]
Paddy Fay Creek	n/a	Home Creek	3-120" CMP[d]
Wolf Creek	n/a	Willow Creek	60" CMP[d]
Circle Creek	n/a	Otter Creek	Bridge[d]
Thorpe Creek	n/a	Spring Creek	78" CMP[d]
Kennedy Creek	n/a	Bridge Creek	84" CMP[d]
Plunket Creek	n/a	Bowman Creek	60" CMP[d]
Geddes Creek	n/a	King Creek	114" CMP[d]
Yank Creek	n/a	Pumpkin Creek	n/a
Miles Creek	n/a	Dry Creek	n/a
Forest Creek	n/a	Prat Creek	n/a
Horse Creek	n/a	Nelson Creek	n/a
Six Mile Creek	n/a	Ash Creek	n/a
Miller Creek	n/a	Dry Creek	n/a
Pump Creek	n/a	Cheever Creek	n/a
Cow Creek	n/a	Sand Creek	n/a
Ranch Creek	n/a	Foster Creek	n/a
Coal Creek	n/a	Stony Creek	n/a
Cottonwood Creek	n/a	Elk Creek	n/a
Dry Creek	n/a	Lay Creek	n/a
Trail Creek	n/a	Coon Creek	n/a
Alfalfa Creek	n/a	Garden Creek	n/a
Hurt Creek	n/a	Liscom Creek	n/a
Joe Leg Creek	n/a	Big John Creek	n/a
Hammond Draw	n/a	Freda Creek	n/a
S. Fork Cow Draw	126" CMP[c]	Goodale Creek	n/a
Rosebud Creek	Bridge	Straight Creek	n/a
Greenleaf Creek	216" CMP	Diamond R Creek	n/a
Roe & Cooper Creek	54" CMP	Beaver Creek	n/a
Tongue River	Bridge	Houston Draw	n/a
Colbert Coulee	84" CMP[d]	Bringoff Creek	n/a
Double E Coulee	96" CMP[d]		

[a] The stream names are in downstream to upstream order crossed by the Colstrip alternative route

[b] n/a indicates that the stream is not crossed

[c] CMP = corrugated metal pipe culvert used for stream crossing

[d] Crossing structure is the same as for the proposed rail line

posed rail line and, therefore, ground water aquifers should not be impacted from construction.

The Colstrip alternative would require construction of a bridge across Rosebud Creek. Flood-prone areas at this crossing would be impacted; however, given proper design and construction of the bridge, the flood plain would not be impacted significantly.

A9.4.2 Operation and Maintenance

Operation and maintenance impacts of a railroad over the Colstrip alternative route would be essentially the same as for one over the route of the proposed rail line. The shorter length of the Colstrip alternative route and less proximity to the Tongue River and its tributaries would reduce the risk of altering water quality from fuel, coal, and chemical spills. Fueling for TRRC trains would take place at the Colstrip interchange yards.

A9.4.3 Related Actions

The Colstrip alternative would serve the same potential coal mines as would the proposed rail line. Impacts to hydrologic resources would be the same in either case.

A9.5 FOOTNOTES

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A10.0 AQUATIC ECOLOGY

A10.1 PROPOSED ACTION

A10.1.1 Construction

Impacts to aquatic resources from construction of the proposed rail line are primarily a function of encroachments on streams and rivers, and a resultant increased sediment load. Encroachments on any stream from the construction of bridges or from the installation of culverts could increase sediment loads and thereby affect aquatic resources. However, the most likely and most important impacts would occur from the crossing of perennial streams by the proposed rail line with either Ashland alignment or any of the alternatives. Construction-related activities at these crossings also may result in fuel and chemical spills from heavy equipment. Such spills could impact aquatic resources at the crossing sites. Finally, rail line construction in flood-prone areas could cause a restriction of the flood plain and a consequent alteration and/or loss of habitat.

A10.1.1.1 Sedimentation

The biological effects of sedimentation can be analyzed in terms of major aquatic ecosystem components. The breakdown includes the impacts on primary producers, macroinvertebrates, and fish.[1] The production of primary producers (plankton and periphyton) can be reduced by the reduction of light penetration and/or the removal of suitable substrate by scouring or siltation. Studies have shown that a 40 mg/liter (mg/l) increase in Total Suspended Sediment (TSS) can cause a 25-percent reduction in invertebrate production.[2] Construction of the proposed rail line is estimated to increase TSS in the Tongue River by roughly 12 to 13 mg/l. TSS in Otter Creek would increase by about 19 mg/l. These increases then would affect primary productivity at a rate substantially less than would be necessary to account for a 25-percent reduction.

Culverts would be used to cross ephemeral streams and would be of sufficient size to avoid increases in TSS concentrations (see section A9.1.1.3, Table A9-2). Proper placement of culverts only in these smaller, intermittent streams, which do not generally support important fisheries, should mitigate against significant impacts to aquatic resources in the project area.

Sediment impacts on fish species vary depending upon life stages. Fish in the early stages of development (particularly salmonids) generally are more susceptible to adverse effects of sedimentation than those in later stages of growth. However, additional sediment loads caused by right-of-way construction have a less apparent, but additive, affect on fish populations. The estimated increases in sediment load in the Tongue River and Otter Creek should not be great enough to adversely effect fish populations.

The greatest potential impact to fish populations is associated with the construction of bridges across the Tongue River and Otter Creek. These crossings would raise TSS levels for short periods. In addition, bridge construction could temporarily block fish passage. The greatest adverse impacts from these crossings would be experienced in spawning areas that might be immediately downstream from the river crossings. Paddlefish, shovelnose sturgeon and sauger are known to spawn in the lower 20-mile segment of the Tongue River during high water (Fishery Zone I). The location of the proposed Tongue River crossing (8 miles above Ashland, Montana) would not adversely affect these potential spawning areas.

Construction of the proposed rail line near the town of Ashland could impact aquatic resources. The Ashland SE Alignment includes a 140-foot single span bridge across Otter Creek in Section 11, Township 3 South, Range 44 East, that would not require the placement of piers in the creek, but would necessitate the construction of a 400-foot-long binwall along both banks of the creek. The binwall should not disrupt the natural hydraulics of lower Otter Creek. However, should a spawning area be located downstream from the proposed stream crossing, as existing data seem to indicate, the impacts from the construction of the binwall could adversely affect fish population in this section of the stream. This section of Otter Creek is classified as having a resource value of 3. It is low in sport fishery value, but high in habitat and species value.

Construction of the Ashland NW Alignment also could impact aquatic resources. A 140-foot bridge across Otter Creek, in Section 2, Township 3 South, Range 44 East, would be constructed along this alignment. Existing data indicates that a spawning area for a number of species may be located in the crossing area. The impacts from bridge construction could adversely affect fish populations in this section of the stream. To mitigate the possible impact to fisheries, it would be necessary to determine the importance of the habitat and whether construction schedules should be based upon noncritical periods for the species found there.

The section of Otter Creek crossed by the Ashland NW Alignment is classified as having a resource value of 3. It has a low value for its sport fishery potential, but a high value for its habitat and species value. Since the confluence of Otter Creek with the Tongue River occurs in the proximity of the bridge, it is necessary to consider that area, designated as Tongue River Fishery Zone IV, as well. This zone has also been classified as having a resource value of 3. It is lower in sport fishery value, but high in habitat and species value. The smallmouth bass population located in this zone is the highest in the entire Tongue River.

In addition, the Ashland NW Alignment would not require the major cut included in the Ashland SE Alignment. The sedimentation impacts expected with this large cut would not occur. Lesser impact to aquatic resources because of the absence of the large cut, as well as the

decrease in total acreage disturbed, could be anticipated with the NW Alignment.

As structures, bridges present few problems for aquatic resources. Properly constructed bridges over all fishery streams and permanent water bodies should have little long term impact to aquatic flora and fauna. However, where bridge piers must be set in streams with erodable beds, some scouring during flood periods could occur.[3] The proposed crossing of the Tongue River in Section 27, Township 1 South, Range 44 East, would be the only location for a bridge with piers. Should scouring occur, TSS levels might be raised temporarily.

Many of the impacts to aquatic resources from bridge construction can be mitigated by conducting site specific sampling work at stream crossings prior to construction. The Montana Streambed Preservation Act requires that fisheries data be collected during the spring and fall. Should this data reveal that a river crossing is adjacent to a spawning area, a program could be established to undertake construction during noncritical times. The Tongue River Railroad Company is prepared to commence site specific inventory prior to the completion of detailed third phase engineering, thus allowing sufficient time for data collection.

Mitigative measures for impacts to aquatic resources also include: (1) expeditious completion of all in-stream work; (2) the use of construction pads and work platforms to avoid equipment entering the stream; (3) immediate revegetation and stabilization of the adjacent river banks.

Compensation for lost aquatic habitat has been utilized in the past for mitigation. The TRRC, in conjunction with the Montana Department of Fish, Wildlife and Parks, could use fill from the right-of-way cut areas to create water impoundments. It should be noted, however, that such a mitigative measure may cause problems for adjacent landowners.

A10.1.1.2 Fuel and Chemical Spills

Fuel and oil spills into the Tongue River, Otter Creek, or intermittent tributaries could impact the streams' aquatic ecosystems. The potential impact to aquatic resources from construction-related fuel and oil spills is difficult to assess. The toxicity of the chemical is a function of the chemical and physical properties of the substance and the rate of entry of the material into a stream. Certain components of oil--particularly the lighter weight, aromatic compounds--are very toxic to aquatic organisms. These components are, however, highly volatile and may biodegrade rapidly, thus reducing the amount of time that the oil remains toxic. It is likely, however, that the construction-related fuel and oil spills that occur adjacent to the Tongue River or Otter Creek would cause some immediate short term impact to aquatic organisms.

Immediate impacts to aquatic resources from fuel and oil spills would be difficult to mitigate. Preventing construction equipment from directly entering streams during bridge construction, placement of culverts during times of minimal or no water flow, and development of an oil spill contingency plan would help to mitigate potential impacts from fuel and oil spills.

Long term effects of fuel and chemical spills on aquatic resources are difficult to determine. Some of the heavier hydrocarbons remain evident in sediments for long periods after a spill.

A10.1.1.3 Construction in Flood-prone Areas

Crossing the Tongue River and Otter Creek would necessitate encroachments in flood-prone areas. Proper bridge design with the provision of sufficent flow capacity should prevent significant alteration of the flood plain and thereby insure against the loss of aquatic habitat. Timing of construction of the railroad grade to avoid high discharge periods and stabilization of the railroad bed soon after its completion would help prevent impacts to the flood plain and consequent effects on aquatic resources (see section A9.1.1.4).

A10.1.1.4 Impact from Human Activity

Impact from transient construction populations could include direct contamination of water sources from sewage, accidental fuel spills, and solid or other types of waste. Impacts such as these can best be mitigated by careful planning. The construction program for the proposed rail line anticipates the establishment of four or five construction camps. These camps would not be located near perennial streams and would employ self-contained trailers as living quarters. Given this plan, impacts to aquatic resources should be minimal.

A10.1.2 Operation and Maintenance

Expected impacts from the operation and maintenance of the proposed rail line are very general in nature, and do not change significantly in response to the variety of yearly tonnage scenarios.

A10.1.2.1 Fuel and Chemical Spills

Accidental fuel and/or chemical spills from the operation of TRRC trains could impact aquatic resources. Depending upon the location of the spill, aquatic flora and fauna could be affected for between 1 week and 1 year after the accident. Coal spills in spawning areas from train derailments could interfere with fish propagation. A discussion of the potential for train derailment is presented in section A7.0 and more detailed discussion of possible impacts to water quality from accidental spills is presented in Section A9.1.2.

A10.1.2.2 Use of Herbicides in Right-of-way Maintenance

Herbicides--most likely 2,4-D--could be used to curtail the growth of noxious weeds in the proposed rail line right-of-way. Possible overspraying and wind drift of herbicides should not introduce toxic substances into a water body in amounts that would be toxic to aquatic biota. However, toxic substances would occur in the immediate vicinity of a herbicide spill, but should be quickly dispersed due to the high water solubility of 2,4-D and natural mixing in the stream. Additional discussion of the potential problems from herbicides is presented in section A9.1.2.

A10.1.2.3 Impact from Human Activity

Increased human population in the area may result in greater fishing pressure. This could cause a decrease in the value of the fishery resource from a quantitative point of view. Existing data, however, indicate that the Tongue River fishery can sustain a substantial increase in fishing pressure without suffering a reduction in overall quality.

A10.1.3 Related Actions

Potential impacts to surface water quality from the establishment of mines in the project area is discussed in section A9.1.3.1. Existing federal and state regulations should protect aquatic resources from increased sediment loads to streams as a result of mining. TDS levels would rise in both the Tongue River and Otter Creek with the operation of five mines. However, the expected TDS levels should not alter the suitability of water for existing uses and should not significantly impact aquatic resources.

A10.2 TONGUE RIVER ROAD ALTERNATIVE

A10.2.1 Construction

The construction of the TRRC rail line along the Tongue River Road alternative route could impact aquatic resources in a few different locations and in a slightly higher magnitude than the proposed rail line. Sediment load in the Tongue River is estimated to increase by 13 mg/l, while Otter Creek would increase by 19 mg/l. As with the proposed rail line, these increases would not be substantial enough to affect aquatic resources.

The construction of a rail line along the Tongue River Road alternative route would differ from the proposed rail line with respect to river crossings. Fewer intermittent streams would be crossed on this alignment than with the proposed rail line. However, the Tongue River Road alternative route would require construction of an additional 150-foot-span bridge across Pumpkin Creek. While data on the fishery

resources of Pumpkin Creek are limited, this stream has been highly rated for its species and habitat value.[4] Furthermore, since the confluence of Pumpkin Creek with the Tongue River is in the proximity of the possible bridge site, the construction wash could impact an area that has been rated a substantial fishery resource.[5] Channel catfish are more abundant in this zone than in any other part of the Tongue.

Crossing the Tongue at a point roughly 10 miles south of Miles City would affect a section of the river which has a resource value equivalent to that of the proposed rail line river crossing. However, paddlefish, shovelnose sturgeon, and sauger are known to spawn in this lower section of the Tongue during periods of high water.

The crossings of Otter Creek for the Tongue River Road alternative route would be the same as those for the proposed rail line. The description of the impacts for both Ashland alignments would be the same as the description presented for the proposed rail line.

Provided that they are constructed correctly, bridges should have no long term impacts to aquatic resources. Construction of the bridges would cause temporary increases in TSS levels in the Tongue River and Otter Creek. Should the crossing occur in a spawning area, the habitat would be lost. However, there are no known critical aquatic habitats in the area and there are no known species of flora or fauna currently listed on the federal or state lists of endangered species.

Fuel, oil, and chemical spills associated with construction of the Tongue River Road alternative would impact the Tongue River or Otter Creek in a similar manner as described for the proposed rail line. Fuel or chemical spills occurring due to construction of the Pumpkin Creek crossing or the Tongue River crossing would be closer to the mouth of the Tongue River than those of the proposed rail line. Conceivably, chemicals would be more likely to affect the Yellowstone River with this alternative route than for the proposed rail line.

The construction of the railroad on the Tongue River Road alternative route would affect flood-prone areas nearer to Miles City than on the proposed rail line. However, proper design of the bridge structure should not significantly alter the 100-year flood plain.

Mitigative measures for the Tongue River Road alternative would be the same as those described for the proposed rail line.

A10.3.2 Operation and Maintenance

Impacts and mitigative methods that would result from operation and maintenance of the Tongue River Road alternative would be the same as those for the proposed rail line, including both alignments near Ashland.

A10.3.3 Related Actions

Related actions for the Tongue River Road alternative would affect aquatic resources in the same manner as was discussed for the proposed rail line.

A10.3 MOON CREEK ALTERNATIVE

A10.3.1 Construction

Construction of the TRRC rail line along the Moon Creek alternative route would impact aquatic resources in different locations and in significantly higher magnitude than the proposed rail line. This is due to the construction of a super span bridge across the Yellowstone River that is included only in the Moon Creek alternative route. In other respects, impacts will be comparable to those anticipated for the proposed rail line.

The estimated sediment load increase for the Tongue River is 13 mg/l, while the estimated increase for Otter Creek is 19 mg/l. As with the proposed rail line, these increases would not be substantial enough to affect aquatic resources.

The major difference between the Moon Creek alternative route and the proposed rail line is the Yellowstone River crossing. Bridge approaches will cross major flood-prone areas. The impacts of this crossing would be more serious than crossings proposed by other alternatives because of the magnitude of the construction effort. Sediment loads would be increased, resulting in habitat alteration and loss. Fish passage would be blocked for periods during construction and flood plain alteration would occur. The bridge would be built on a section of the Yellowstone River which has a resource value of 2, a high priority fishery resource. The area has been given high values for its sport fishery potential and its habitat and species value. The reach contains sauger, burbot, channel catfish, and smallmouth bass.

Mitigation efforts for potential impacts from construction of this bridge would be the same as those for other river and stream crossings. Construction should be scheduled to avoid interference with critical periods for the species that occur at the crossing site. Once construction has begun, it should continue nonstop until the bridge is completed in order to limit the duration of stream blockage. Also, proper sizing and installation of all drainage structures is extremely important for the Yellowstone crossing.

Fuel, oil, and chemical spills associated with construction of the Moon Creek alternative would impact the Tongue River or Otter Creek in a similar manner as described for the proposed rail line. Impacts to

the Yellowstone River would be more severe, only as related to the higher value ascribed to the aquatic resource.

Mitigative measures for the Moon Creek alternative would be identical to those discussed for the proposed rail line.

A10.3.2 Operation and Maintenance

Impacts and mitigation measures that would result from operation and maintenance of the Moon Creek alternative would be the same as those described for the proposed rail line.

A10.3.3 Related Actions

Related actions for the Moon Creek alternative would be the same as those described for the proposed rail line.

A10.4 COLSTRIP ALTERNATIVE

A10.4.1 Construction

General categories of impact for the Colstrip alternative are the same as those for the proposed rail line. However, this alternative differs from the proposed rail line in the amount of increase in TSS and the number of stream crossings it would require. Also, this alternative is the only one that would impact Rosebud Creek.

Construction of the Colstrip alternative would raise TSS levels in the Tongue River by 4 mg/l. TSS increases in Otter Creek would be the same as that for the proposed rail line (19 mg/l).

The Rosebud Creek crossing would require construction of a 150-foot-span bridge in a part of the creek that has been given a resource value of 3. It has been classified as a substantial fishery resource because of its high habitat and species value. Although sediment load would increase by only 15 mg/l, an insufficient amount to lower water quality, other factors associated with bridge construction may adversely affect aquatic resources. Construction activities may require temporary blockage of fish passage, temporary alteration of some habitat, and permanent destruction of some habitat.

Mitigation of impacts resulting from construction of the Colstrip alternative would be the same as those described for the proposed rail line.

A10.4.2 Operation and Maintenance

Impacts and mitigation measures associated with operation and maintenance of the Colstrip alternative generally would be the same as

those for the proposed rail line. Fuel, chemical, or coal spills could impact Rosebud Creek on the Colstrip alternative.

The shorter length of the Colstrip alternative route and less proximity to the Tongue River and its tributaries would reduce the risk of impact to aquatic resources from fuel, coal, and chemical spills.

A10.4.3 Related Actions

Related Actions for the Colstrip alternative would be the same as those discussed for the proposed rail line.

A10.5 FOOTNOTES

1. Primary producers-periphyton-measurements are used as indices of a stream's productive potential.

2. Environmental Protection Agency, Water Quality Office. The Effect of Inorganic Sediment on a Stream's Biota, by James R. Gammon (Washington: U.S. Government Printing Office, 1970).

3. Oglesby, C.H., and L.I. Hewes, Highway Engineering (2nd edition, New York: John Wiley and Sons, Inc., 1964).

4. Montana Department of Fish, Wildlife and Parks. The Distribution of Fishes in Southeastern Montana, by Allen A. Elser, Mark W. Bouges, and Lani M. Morris, 1980.

5. Ibid.

A11.0 TERRESTRIAL ECOLOGY

A11.1 PROPOSED ACTION

A11.1.1 Construction

The construction of the proposed rail line would impact terrestrial ecology by removing or altering the vegetation along the right-of-way and by affecting its dependent wildlife population. The following discussion presents those methods used to assess the potential impacts to terrestrial ecology and summarizes the findings.

A11.1.1.1 Vegetation

The potential loss in vegetation resulting from the construction of the proposed rail line was assessed, first by reviewing pertinent literature for the southeastern Montana region.[1] Vegetation and rangeland types then were identified and their distributions were plotted on color aerial photographs (1:17,000 and 1:24,000) of the alignment of the proposed rail line. Thereafter, a reconnaissance-level ground inventory was conducted to verify the aerial findings. Acreage calculations were based on the affected right-of-way data.

The construction of the proposed rail line with the Ashland SE Alignment would remove approximately 1,168 acres of vegetation to Terminus #1 (Montco Mine), and an additional 110 acres to Terminus #2 (Otter Creek). Construction of the Ashland NW Alignment would affect 46 fewer acres. The five construction camps needed for the proposed rail line would affect an estimated additional 200 acres of vegetation. Borrow areas, as yet unlocated, would impact another 20 acres.

Ten vegetation types are found within the project area. Table A11-1 provides a distribution by vegetation type for the acres that would be removed by the rights-of-way of the proposed rail line. Acreage that would be removed by construction camps and by borrow areas is not included in this total, since the exact size and location of these sites have not been determined.

Vegetation types receiving the most impact from the construction of the right-of-way corridor with the Ashland SE Alignment include: big sagebrush (440 acres, 34 percent), prairie (263 acres, 20 percent), agricultural (235 acres, 18 percent), and silver sagebrush (225 acres, 18 percent). In addition, 47 acres of pine/juniper, 40 acres of sumac, 19 acres of deciduous tree/shrub, 5 acres of breaks, 3 acres of greasewood, and 1 acre of aquatic vegetation would be removed by the construction of the proposed rail line. These figures would change slightly with the Ashland NW Alignment. Less prairie and more sagebrush would be removed.

TABLE A11-1

ACRES OF VEGETATION TYPES AFFECTED BY THE PROPOSED ACTION

VEGETATION TYPES	AFFECTED ACREAGE ASHLAND SE ALIGNMENT	ASHLAND NW ALIGNMENT
Deciduous Tree/Shrub	19	20
Aquatic	1	1
Pine/Juniper	47	46
Silver Sagebrush	225	227
Big Sagebrush	440	451
Sumac	40	40
Breaks	5	5
Agriculture	235	236
Greasewood	3	3
Prairie	263	203
TOTAL ACRES[a]	1,278	1,232

[a] Totals do not include 200 acres for construction camps and 20 acres for borrow areas

Limited or Unique Vegetation

Approximately 37 acres of irrigated cropland--of which none is prime agricultural land--and 19 acres of deciduous tree/shrub vegetation would be removed by the construction of the proposed rail line with the Ashland SE Alignment. The total, 56 acres, is considered highly productive and is limited in the project area. Along the Ashland NW Alignment, about 8 acres of irrigated cropland and 1 acre more of deciduous tree/shrub vegetation would be affected.

No threatened or endangered vegetation species have been recorded in the right-of-way corridors of the proposed rail line. After the location of the final alignment, and prior to its disturbance, a field search for threatened or endangered plant species would be appropriate. By this means, any unique plant species could be identified and appropriate mitigative measures could be implemented.

Mitigative Measures

The most important mitigative measure is proper planning for the reclamation of disturbed areas. A revegetation plan specific to the proposed right-of-way corridor will be prepared prior to disturbance. The implementation of the following measures would reduce the level of impact from the rail line's construction:

(1) Revegetation quickly following disturbance
(2) Selection of suitable species, by an analysis of site soil characteristics, precipitation patterns, and slope and aspect
(3) Selection of suitable planting dates, by an analysis of site seed requirements
(4) Use of non-native plants if vegetation begins at a time when native species cannot be planted successfully
(5) Selection of appropriate planting methods, i.e., drill-seeding, hydro-seeding, broadcast-seeding, etc.
(6) Consideration of erosional problems in advance of planting. For example, cut and fill slopes should be reduced to the flattest angle practical. Slopes could be terraced where the reduction of those slopes is impractical. The mulching and planting of trees and shrubs in containers near stream banks could speed revegetation and, thus, control erosion
(7) Periodic inspection of reclaimed acres, including an outline of follow-up measures to insure successful reclamation, especially in areas where soils, slope, or topography impede revegetation

A11.1.1.2 Wildlife

The amount of wildlife habitat that would be removed by the right-of-way of the proposed rail line is the same as that acreage indicated for vegetation: 1,278 acres with the Ashland SE Alignment, and 1,232 acres with the Ashland NW Alignment. Within the right-of-way area exist 10 distinct wildlife habitats that correspond to the vegetation types identified in Table A11-1. These wildlife habitats were evaluated according to their expendability. Expendability was defined subjectively by the relative amount of a given habitat in the project area, by the reclamation potential of each habitat, by the use of each habitat by important wildlife species, and by the type and intensity of other land uses competing with wildlife for that habitat.[2] Since 10 habitats were considered, the least expendable was given a rank of 10, and the most expendable was ranked 1. Where the expendability of two or more habitats was considered approximately equal, their ranks were averaged. The resultant ranks are presented in Table A11-2.

This analysis indicates that the deciduous tree/shrub, the aquatic, and the pine/juniper are the important wildlife habitats found in the project area. These habitat types constitute 67 acres of the proposed rail line's right-of-way, or roughly 5 percent of the affected land (see Table A11-1).

Specific Use Areas

Within the project area exist several kinds of specific use areas. Data on these areas were developed from information supplied by general literature review, by Montana Fish, Wildlife and Parks personnel, by an aerial reconnaissance of the route of the proposed rail line and possible alternatives, and by an on-site visit to the USDA Livestock and Range Research Station (LARRS).[3] These specific use areas include

TABLE A11-2

EXPENDABILITY RANKS OF WILDLIFE HABITATS
IN THE TONGUE RIVER RAILROAD PROJECT AREA

HABITAT TYPE	RANK[a]
Deciduous Tree/Shrub (Riparian)	10
Aquatic (Riparian)	9
Pine/Juniper	8
Silver Sagebrush	5.5
Big Sagebrush	5.5
Sumac	5.5
Breaks	5.5
Agriculture	3
Greasewood	2
Prairie	1

[a] The greater the value, the less expendable the habitat

riparian habitat (mesic sites with deciduous trees and shrubs), fawning areas, major mule deer and antelope winter ranges, prairie grouse leks, prairie dog colonies, raptor nests and potential raptor nesting sites, such as cliffs and rock formations.

Specific Use Areas: Fawning Sites

Most of the habitats in the project area provide fawning sites for antelope and for mule deer. In general, however, antelope fawn in sagebrush or grassland, whereas mule deer prefer mesic sites with adequate tree and shrub cover. Whitetailed deer usually fawn in riparian or in associated habitats. The greatest impact of construction during fawning season is the displacement of pregnant does from these otherwise adequate sites. This impact can be mitigated by the timing of construction to avoid conflict with wildlife if preconstruction surveys indicate the existence of important fawning areas along the route.

Specific Use Areas: Mule Deer and Antelope Winter Range

Mule deer winter range may vary within the project area, from big sagebrush and sumac to breaks and pine/juniper. Steep topography and south-facing slopes usually characterize mule deer winter range. In contrast, wintering antelope prefer relatively gentle to rolling terrain in upland areas, often in association with big sagebrush.

Data obtained from aerial reconnaissance indicates that riparian areas along the Tongue River are used heavily by whitetailed deer during the winter months. Mule deer were sighted upland from the

river, although considerable movement between the river and the breaks was noted. Construction of the railroad should not significantly affect mule deer winter range, although some deer movements to the river might be disrupted. Little riparian habitat would be affected by construction of the proposed rail line. However, some disruption of whitetailed deer movement might occur during construction. Lack of construction activity during harsh winter weather may serve as a mitigating factor.

Generally, the rail line's impacts to big game winter range can be mitigated by timing construction to avoid conflict with deer using specific crossing areas.

Specific Use Areas: Grouse Lek Sites

Grouse leks usually are located on small knolls or upland benches. They may be used for years by the succeeding generations of a local population, or they may be ephemeral in nature. Most female grouse nest within 1.5 miles of the lek site, usually in dense cover. If a lek is disturbed by construction, the birds either will seek a new lek site or will be adopted into adjacent lek populations. If neither of these changes occurs, a local population may cease reproduction. Thus, the regional grouse population might be affected by the loss of a single lek site. If a lek site is not destroyed, but rail line construction is near enough to interfere with the act of displaying, the affected grouse may abandon the site, with the same effects to the population.

Impacts from rail line construction adjacent to the lek sites can be prevented by the timing of construction to avoid conflicts with grouse using lek areas.

Specific Use Areas: Raptor Nests and Potential Nesting Sites

Approximately 20 species of raptors may nest in the Tongue River region. The two most significant species in the area are the golden eagle and the prairie falcon. The destruction of their nesting sites would cause the displacement of some of these raptors, which may reduce the local raptor population. The indirect disturbance of raptor nests during chick incubation may cause the abandonment of these nests, although the specific nesting sites would not be destroyed.

A midwinter aerial reconnaissance of the route of the proposed rail line did not reveal the presence of golden eagle nests. Inspection of the cliffs prior to construction of the rail line would provide additional data on existing nests.

Specific Use Areas: Blacktailed Prairie Dog Colonies

Colonies of blacktailed prairie dogs are common in the project area. Rail line construction through an active colony would destroy part or all of that colony, depending upon its size and upon the loca-

tion of the right-of-way through it. Although local populations may be eliminated, the impact to regional prairie dog populations probably would be insignificant. A greater threat posed by the destruction of prairie dog colonies is the elimination of a potential habitat for the endangered blackfooted ferret. It should be noted that the presence of blackfooted ferrets has not been documented in the project area.

Displacement Due to Human Activity

Human activity, noise, dust, and traffic might cause some animals to avoid areas that they normally would inhabit. This impact may be short term, extending only through the construction phase, or it may be long term, enduring after the construction phase.[4]

The short term displacement would vary by species. Big game may be displaced 0.25 to 0.50 mile, whereas small mammals may remove just beyond the disturbed area.[5] Nesting or roosting birds--particularly upland game birds, waterfowl, raptors, great blue herons and other colonial nesting species--may abandon their nests near the disturbance corridor. If these species do not return to the affected area, and if nesting sites are not reoccupied, the human activity displacement becomes long term.

The loss of nesting or roosting sites, prairie dog or ground squirrel colonies, fox or coyote dens, marmot dens, and rock outcrops would displace wildlife. The destruction of part of a big game winter range may cause the abandonment of the entire range, or it may reduce the carrying capacity of the remainder of the range. Carrying capacity is defined as the maximum number of animals of a given species in a given area, beyond which number no significant increase can occur without causing damage to the range resource.

Changes in Mortality and Natality

An increased mortality rate might be expected for some species as a result of rail line construction. Small mammals, reptiles, and amphibians, unable to avoid construction activity, would be killed. Fledglings in destroyed nests would die, as would young birds in abandoned nests. Larger mammals and adult birds may be killed by vehicles. Increased human population in the study area would contribute to increased legal and possibly illegal hunting pressure.

Displaced animals may be more susceptible to predators, because they exhibit abnormal habitat occupational patterns--i.e., social conflicts with individuals already resident in an area. Further, spills of toxic substances may increase wildlife mortality by means of acute or chronic toxicity, the displacement of individuals from polluted sites, and the coating of skin, fur, and feathers.

Natality may be reduced through the destruction or abandonment of nests, through individual displacement, or through behavioral or phys-

iological changes that prevent or reduce reproductive activity and affect clutch or litter size.

Stress also may affect mortality and natality rates.[6] Stress, although difficult to define and to evaluate, is a recognizable impact to wildlife. Stressful conditions usually are the worst in winter, when many species exist in marginal habitat and/or in poor nutritional condition. Stress also may affect mortality and natality during critical periods of the reproductive cycle: e.g., immediately prior to fawning, or during lekking displays. At these times, stress caused by noise, by harrassment, by displacement, or by other activities associated with construction may weaken an animal or may make it more susceptible to starvation, disease, or predators--or even distract the animal from reproductive behavior.

Changes in mortality and natality rates should be short term impacts. Most species would return to their normal behavioral patterns after the completion of the railroad construction.

Endangered Species

The U.S. Fish and Wildlife Service has determined that the following listed, threatened, and endangered species may be present in the project area:

	Listed Species	Expected Occurrence
(1)	Blackfooted ferret (*Mustela nigripes*)	Possible resident of prairie dog towns
(2)	Bald eagle (*Haliaeetus leucocephalus*)	Migration and winter periods
(3)	Peregrine falcon (*Falco peregrinus anatum*)	Spring and fall migration periods

Resident individuals of these species have not recently been recorded in the project area. Bald eagles are known to winter along the Tongue River below the Tongue River Reservoir, but there are no known active eyries in the project area. A thorough assessment of potential impacts to any of these species will be conducted immediately upon final route selection.

A11.1.2 Operation and Maintenance

Once rail line construction is completed and the railroad begins operation, the impact of vegetation/habitat loss or alteration becomes less important a factor than does a series of secondary impacts caused by herbicides, fires, coal dust, wildlife displacement, changes in wildlife mortality and natality, and stress.

A11.1.2.1 Vegetation

Effects of Herbicides

The County Weed Control Act (7-22-2101-2150-MCA 1980) requires the control of noxious weeds along rights-of-way. Weeds may be sprayed with herbicides to inhibit the growth of unwanted vegetation. The use of herbicides: (1) could damage native plant species along the right-of-way; (2) could increase the fire danger along the right-of-way because of dead or dying vegetation; (3) could affect experiments at the USDA Livestock and Range Research Station (LARRS). The use of mechanical or incendiary methods of weed control, especially on the LARRS, would reduce impacts to vegetation.

Fires

Locomotives, other railroad equipment and maintenance activities can be ignition sources for range fires and for forest fires. Trackside fires can be started from:

(1) Hot fragments ejected by brake shoes pressing against steel wheels
(2) Small particles of carbon expelled from the exhaust systems of diesel engines
(3) "Hot box" fires in journal boxes, usually the result of faulty lubrication
(4) Welding and grinding associated with track maintenance
(5) The supervised burning of the railroad right-of-way that escapes control
(6) Flares, used as a safety measure along the right-of-way when the line is blocked
(7) Catalytic converters on maintenance vehicles that encounter and ignite dry vegetation

Fires are best mitigated by a well-developed prevention plan, including both adequate equipment maintenance and fire-safety instruction for maintenance crews.

Coal Dust

The effects of coal dust upon vegetation generally are unknown. The possible effects may include modifications in the microclimate of the area. These modifications then may affect changes in existing vegetation and/or in proposed revegetation plans. Coal dust also may affect projects underway at the LARRS, by introducing a new variable that must be assessed in evaluating research results.

Coal dust emissions from TRRC trains are expected to be small. The Montana Air Quality Bureau has determined that coal dust would not constitute a significant problem (see section A5.1.2). Therefore, one would anticipate little effect on vegetation from coal dust.

A11.1.2.2 Wildlife

Barrier to Movement

The railroad right-of-way may act as a barrier to the normal daily or seasonal movement of wildlife. Some species will react by adjusting their daily and seasonal ranges to exclude the barrier. Although some species will not cross the rail line, the impairment of movement varies greatly by species. For instance, deer usually will leap right-of-way fences with little difficulty.

The species of greatest concern in the project area is antelope. Unlike deer, antelope seldom jump fences. Antelope movement may be restricted if the right-of-way is fenced with woven wire or with multi-strand barbed wire that situates the bottom wire less than 16 inches above the ground, making it impossible for antelope to crawl underneath. Migration routes between seasonal ranges thus could be interupted, because antelope are not able to pass under a fence.

Barrier impacts can be mitigated by proper fencing. A three-strand or a four-strand barbed wire fence is preferable. The bottom wire of the fence should run at least 16 inches above the ground and preferably be barbless.

Collisions

As wildlife species become accustomed to regular intervals of noise, dust, and motion, they may lose their wariness of operating trains. With an increased number of trains per day, an increase in the frequency of train/wildlife collisions can be expected. In general, wildlife losses due to collision will not impact significantly the regional populations. However, if the right-of-way passes through areas where animals congregate in large numbers, such as wintering grounds, the likelihood of collision will increase.[7]

Noise, Dust, Fuel Spills, Fires

Noise, dust, fuel spills, and fires may increase wildlife stress or further alter wildlife habitat.[8] Some species may be seriously affected by noise, whereas other species readily will adjust to it. High background noise levels can interfere with grouse vocalization, causing the abandonment of leks, which then results in a reduced grouse reproductive rate. Colonial nesting birds can be affected similarly. Noise also may become a problem to wintering big game populations.

The effects of dust from passing trains on vegetation and wildlife may include:

(1) Changes in plant species diversity and density as a result of direct dust fall
(2) Slow physical and chemical changes in the soil

(3) Changes in plant communities that will reflect in the different use patterns of local wildlife
(4) Physical irritation to some mammals, caused by direct dust fall

Little research has been conducted regarding dust loss due to passing coal trains. However, for reasons stated previously, the impact is expected to be minimal.

The accidental spills of fuel, oil, or other chemicals may result in acute or chronic physiological stress, or in habitat alteration, for wildlife, depending on the kind and on the size of the spill.

Range fires caused by passing trains can alter large areas of wildlife habitat, as well as contribute directly to mortality. Fires, deleterious in the initial effect, also may cause long range habitat changes that are beneficial to some species.

Little can be done to mitigate the impacts of noise and dust. Fuel spills and fires best can be mitigated by means of proper safety and maintenance programs.

Right-of-way Maintenance

Either regular or sporadic human presence along the right-of-way can cause the short term displacement of wildlife and may contribute to wildlife stress. The aerial surveillance of the right-of-way also can cause similar displacement, the disruption of nesting and breeding, and stress.

The control of noxious weeds along the right-of-way may involve the use of chemical sprays. These chemicals might kill wildlife directly or might result in a long term chronic toxicity developing through an entire local food chain. In terms of mitigation, it is recommended that herbicides be used sparingly, and that mechanical or incendiary methods of weed control be employed.

Transmission Lines

A three-strand, 2,400-volt communication/transmission line would be constructed within the proposed rail line's right-of-way. Considerable research has failed to demonstrate that high voltage electrical transmission significantly effects wildlife. Theoretically, chronic effects on wildlife from electric transmission could include changes in the intensity and in the duration of wildlife activity, in growth rate, in disease immunity, and in sexual potency. However, the significance of these changes has not been demonstrated and, apparently, no acute effects are caused by corona noise.[9]

Birds may be killed during flight by wire strikes. Raptors and other large birds also may be injured or killed by electrical shock. However, the proposed transmission line will carry only one hot wire,

and the pole ground wire will be gapped to reduce the possibility of simultaneous contact.

A11.1.3 Related Actions

A11.1.3.1 Vegetation

The construction of the Tongue River Railroad right-of-way assumes its potential to serve several new coal mines in the area. All three production scenarios envision five new mines in that area served by the railroad. Approximately 25,889 acres would be disturbed during the next 50 years under the low coal production scenario, 29,999 acres at the medium production scenario, and 31,349 acres with the high production scenario. Revegetation normally follows mining by 2 to 5 years. Thus, the total unrevegetated area, for any given year, can be calculated by totaling the disturbed acres for the preceding 2 to 5 years. Approximately 4,320 acres would be unrevegetated in the year 2011 under the high coal production scenario, assuming that revegetation follows mining by 5 years. Productivity loss calculations in section A1.0 assume 7 years before disturbed acreage is returned to previous use. Vegetative cover will occur sooner, but the additional time will be required to assure that reclamation is successful.

The generalized impacts of coal mining on vegetation are similar to those impacts resulting from construction:

(1) The loss of vegetation until revegetation is successful
(2) The long term elimination of the natural vegetation mosaic and a decrease in species diversity on disturbed areas
(3) The short term, and possibly long term, changes in species composition. Cool season species tend to be more successful in disturbed areas than are warm season species
(4) Reclaimed vegetation would be more susceptible to drought, with the result that reseeding may be necessary
(5) Species requiring specialized microenvironments would exhibit poor long term success on reclaimed surfaces
(6) Reclaimed and native vegetation near the proposed mines would be impacted by such disturbances as dust, off-road vehicle travel, and fire. Such impacts would cease with mine abandonment.

The mitigative measures for these impacts would be the same as those measures considered for the proposed rail line. In addition, stringent state regulatory controls are in force to assure that surface-mined areas are adequately reclaimed.

A11.1.3.2 Wildlife

Wildlife populations would be affected by mining development and by the increase in human populations associated with the mines. Impacts would include: (1) habitat loss or alteration; (2) displacement; (3) stress; (4) changes in mortality or natality rates.

The number of acres of a particular habitat type that would be disturbed at any given period by mining operations is difficult to predict. However, the total number of disturbed acres for any given year during the next 50-year period, can be estimated in the manner discussed under vegetation.

The degree of impact resulting from displacement, stress, and changes in mortality or natality rates due to mining operations, is equally difficult to predict. However, the causes of these impacts are the same as those causes discussed in terms of the proposed rail line.

An increase in the human population, resulting from the operation of the new coal mines in the region, may be expected to adversely affect wildlife. The present population of the Tongue River Region is expected to increase gradually by 6,000 people by 2010. Impacts to wildlife resulting from this increase would include: (1) habitat loss or habitat alteration for home sites and urban expansion; (2) an increased number of vehicle/wildlife collisions; (3) an increased legal and illegal kill of game and nongame species; (4) an increase in stress due to harassment, either intentional or unintentional; (5) displacement due to the increased human use of areas inhabited by human-intolerant species; (6) an increase in noise, air, and water pollution.

The impacts resulting from these increased human populations may, in the long term, be more significant to wildlife than would be the impacts from construction, operation and maintenance of the railroad, and from mining. The human population impacts tend to be more widespread, less easily regulated, and more difficult to mitigate.

The mitigation of these impacts can be accomplished by means of wildlife enhancement in other areas, by trade-offs in the management of public lands, and by careful human management. In addition to the mitigative methods discussed in terms of the construction and of the operation and maintenance of the proposed rail line, wildlife law enforcement would be necessary; conservation and education programs also would be encouraged.

A11.2 TONGUE RIVER ROAD ALTERNATIVE

A11.2.1 Construction

The construction of the Tongue River Road alternative would impact terrestrial ecology in much the same manner as would the proposed rail line. The impact of the Ashland NW Alignment would be the same should the proposed rail line or any of the alternatives be constructed.

A11.2.1.1 Vegetation

The Tongue River Road alternative route would remove approximately 1,413 acres of vegetation with the Ashland SE Alignment and 1,367 acres with the Ashland NW Alignment. This alternative route primarily would affect big sagebrush (516/527 acres), agricultural (322/323 acres), and prairie vegetation types (285/225 acres). Table A11-3 presents the distribution of vegetation types for the affected acreage.

TABLE A11-3

ACRES OF VEGETATION TYPES AFFECTED BY THE TONGUE RIVER ROAD ALTERNATIVE

VEGETATION TYPE	ASHLAND SE ALIGNMENT	ASHLAND NW ALIGNMENT
Deciduous Tree/Shrub	46	47
Aquatic	1	1
Pine/Juniper	24	23
Silver Sagebrush	161	163
Big Sagebrush	516	527
Sumac	34	34
Breaks	13	13
Agriculture	322	323
Greasewood	11	11
Prairie	285	225
TOTAL[a]	1,413	1,367

[a] Totals do not include 200 acres for construction camps and 20 acres for borrow areas

Limited or Unique Vegetation

Approximately 68 acres of irrigated cropland--of which 17 acres are prime agricultural lands--and 46/47 acres of deciduous tree/shrub habitat would be removed by the construction of the Tongue River Road alternative route. The total, 114/115 acres, is considered highly productive and, therefore, is limited in the project area.

No threatened or endangered vegetation species have been recorded in the Tongue River Road alternative right-of-way corridor. After the location of the final alignment, and prior to its disturbance, a field search for threatened or endangered plant species would be appropriate. Any any unique plant species could be identified and appropriate mitigative measures could be implemented.

Mitigative Measures

The mitigative measures for the Tongue River Road alternative would be the same as those measures described for the proposed rail line.

A11.2.1.2 Wildlife

Approximately 1,413 acres of wildlife habitat would be removed by the construction of the Tongue River Road alternative route with the Ashland SE Alignment and 1,367 acres with the Ashland NW Alignment. Deciduous tree/shrub, aquatic, and pine/juniper habitats would constitute 71 of these acres, or 5 percent of the affected land (see Table A11-3).

Specific Use Areas

The specific use areas for the Tongue River Road alternative route are similar to those for the proposed rail line. Much of the area east of the Tongue River has not been reported on in published literature. However, data obtained from aerial reconnaissance of the Tongue River Road alternative route indicates that the route does not appear to dissect anetlope winter range. In addition, this alternative passes adjacent to mule deer winter range, although there appears to be considerable movement of mule deer between the river and the uplands. This movement could be temporarily disrupted during construction of the Tongue River Road alternative.

Other Impacts

The possible impacts of wildlife displacement and increased mortality and natality, due to the construction of the Tongue River Road alternative, are the same as those impacts for the proposed rail line.

Endangered Species

The presence of resident populations of endangered species--principally the peregrine falcon, the bald eagle, and the blackfooted ferret--has not been documented in the project area.

A11.2.2 Operation and Maintenance

The impacts to terrestrial ecology caused by railroad operation and maintenance along the Tongue River Road alternative route would be the same as those impacts generated by the proposed rail line.

A11.2.3 Related Actions

The Tongue River Road alternative would serve the same potential coal mines as would the proposed rail line. The impacts produced by the development of these mines, therefore, would be the same.

A11.3 MOON CREEK ALTERNATIVE

A11.3.1 Construction

Construction of the Moon Creek alternative would impact terrestrial ecology in much the same manner as would the proposed rail line.

A11.3.1.1 Vegetation

The Moon Creek alternative with the Ashland SE Alignment would remove approximately 1,323 acres of vegetation, or 1,277 acres with the Ashland NW Alignment. This alternative primarily would affect big sagebrush (421/432 acres), silver sagebrush (336/338 acres), prairie (266/206 acres), and agricultural vegetation types (181/182 acres). Table A11-4 presents the distribution of vegetation types for the affected acreage. The upland prairie vegetation types traversed by the Moon Creek alternative route would be more difficult to reclaim than those on the route of the proposed rail line.

TABLE A11-4

ACRES OF VEGETATION TYPES AFFECTED BY THE MOON CREEK ALTERNATIVE

VEGETATION TYPE	ASHLAND SE ALIGNMENT	ASHLAND NW ALIGHMENT
Decidious Tree/Shrub	16	17
Aquatic	4	4
Pine/Juniper	24	23
Silver Sagebrush	336	338
Big Sagebrush	421	432
Sumac	40	40
Breaks	21	21
Agriculture	181	182
Greasewood	14	14
Prairie	266	206
TOTAL[a]	1,323	1,277

[a] Totals do not include 200 acres for construction camps and 200 acres for borrow areas

Limited or Unique Vegetation

Approximately 40 acres of irrigated cropland--none of which are prime agricultural land--and 16 acres of deciduous tree/shrub habitat would be removed by construction of the Moon Creek alternative route.

The total, 56/57 acres, is considered highly productive and therefore limited in the project area.

No threatened or endangered species have been recorded in the Moon Creek alternative route right-of-way corridor. After location of the final alignment, and prior to disturbance, a field search for threatened or endangered plant species would be appropriate. Any unique plant species could be identified and appropriate mitigative measures could be implemented.

Mitigative Measures

Mitigative measures for the Moon Creek alternative would be the same as those measures described for the proposed rail line.

A11.3.1.2 Wildlife

Approximately 1,301 acres of wildlife habitat would be removed by construction of the Moon Creek alternative. Deciduous tree/shrub, aquatic, and pine/juniper would constitute 44 of those acres, or 3 percent of the total affected land (see Table A11-4).

Specific Use Areas

Data regarding specific use areas along the Moon Creek alternative route is extremely limited, as no intensive studies have been conducted along the route. Existing data does indicate that more aquatic, silver sagebrush, greasewood, and breaks habitat would be disturbed by the Moon Creek alternative than would be by the proposed rail line. The Moon Creek alternative would cross mule deer winter range.

Other Impacts

The possible impact of wildlife displacement and increased mortality and natality, due to construction of the Moon Creek alternative route, is the same as those impacts discussed for the proposed rail line.

Endangered Species

The presence of resident populations of endangered species--principally the peregrine falcon, the bald eagle, and the blackfooted feret--has not be recorded in the project area.

A11.3.2 Operation and Maintenance

The impacts to terrestrial ecology caused by railroad operation and maintenance along the Moon Creek alternative route would be the same as for those impacts generated by the proposed rail line.

A11.3.3 Related Actions

The Moon Creek alternative would serve the same potential coal mines as would the proposed rail line. Impacts from the development of these mines, therefore, would be the same.

A11.4 COLSTRIP ALTERNATIVE

A11.4.1 Construction

The construction of the Colstrip alternative would impact terrestrial ecology in much the same manner as would proposed rail line.

A11.4.1.1 Vegetation

The Colstrip alternative route with the Ashland SE Alignment would remove approximately 838 acres of vegetation, or 792 acres with the Ashland NW Alignment. This alternative primarily would affect big sagebrush (271/282 acres), agricultural (96/97 acres), and prairie vegetation types (291/231 acres). Table A11-5 presents the distribution of vegetation types for the affected acreage.

TABLE A11-5

ACRES OF VEGETATION TYPES AFFECTED BY THE COLSTRIP ALTERNATIVE

VEGETATION TYPE	ASHLAND SE ALIGHMENT	ASHLAND NW ALIGNMENT
Deciduous Tree/Shrub	10	11
Aquatic	2	2
Pine/Juniper	50	49
Silver Sagebrush	80	82
Big Sagebrush	271	282
Sumac	37	37
Breaks	1	1
Agriculture	96	97
Greasewood	-0-	-0-
Prairie	291	231
TOTAL[a]	838	792

[a] Totals do not include 200 acres for construction camps and 200 acres for borrow areas

Limited or Unique Vegetation

Approximately 5 acres of irrigated cropland--none of which is prime agricultural land--and 10 acres of deciduous tree/shrub habitat would be removed by the construction of the Colstrip alternative. The total, 15 acres, is considered highly productive and, therefore, limited in the project area.

No threatened or endangered vegetation species have been recorded in the Colstrip alternative route's right-of-way corridor. After the location of the final alignment, and prior to its disturbance, a field search for threatened or endangered plant species would be appropriate. Any unique plant species could be identified in this way, and appropriate mitigative measures could be implemented.

Mitigative Measures

The mitigative measures for the Colstrip alternative would be the same as those measures discussed for the proposed rail line.

A11.4.1.2 Wildlife

Approximately 838 acres of wildlife habitat would be removed by the construction of the Colstrip alternative. Deciduous tree/shrub, aquatic, and pine/juniper habitats would constitute 62 of these acres, or 7 percent of the affected land (see Table A11-4).

Specific Use Areas

The Colstrip alternative route would not affect as much riparian whitetailed deer habitat as would the other possible routes. However, the Colstrip alternative route would cross mule deer and antelope winter range.[10]

Other Impacts

The possible impacts of wildlife displacement and increased mortality and natality, due to the construction of the Colstrip alternative, are the same as those impacts for the proposed rail line.

Endangered Species

The presence of resident populations of endangered species--principally the peregrine falcon, the bald eagle, and the blackfooted ferret--has not been documented in the project area.

A11.4.2 Operation and Maintenance

The operational impacts to terrestrial ecology caused by the Colstrip alternative would be similar to those impacts generated by the proposed rail line. However, the potential for fire along the alternative would be greater because of the east/west orientation of the

alignment. The Colstrip alternative route's south-facing slopes would dry more quickly during the growing season. Vegetation on these slopes, therefore, would provide dry fuel for fires for longer periods than would the vegetation relying upon the annual growth cycle.

A11.4.3 Related Actions

The Colstrip alternative route would serve the same potential coal mines as would the proposed rail line. The impacts produced by the development of these mines, therefore, would be the same.

A11.5 FOOTNOTES

1. This literature review covered a broad range of topics and sources. Of special significance were recent vegetation surveys conducted in connection with the surface-mining permit application process and impact analyses associated with these same proposed and existing mining operations.

2. Data employed in expendability determinations were gathered from a variety of sources. Wildlife use of specific habitats has been documented in a number of baseline surveys associated with the surface-mining permit application process. Habitat reclaimability and competing land use data is derived from similar sources.

3. Aerial reconnaissance was conducted on February 9, 1982.

4. Olson-Elliott and Associates, "Environmental Impact of the Northern Tier Pipeline in Montana: Terrestrial Fauna." Technical report for the Montana Department of Natural Resources and Conservation, Energy Division, 1979. (Hereafter cited as Olson-Elliott and Associates, "Terrestrial Fauna.")

5. Ward, A. Lorin, "Elk Behavior in Relation to Timber Harvest Operations and Traffic on the Medicine Bow Range in South-central Wyoming," pp. 32-43. In Proceedings of the Elk Logging Roads Symposium, Moscow, Idaho. University of Idaho Forest, Wildlife, and Range Experiment Station, 1976.

6. Olson-Elliott and Associates, "Terrestrial Fauna"; Larry S. Thompson, "Identification of Critical Wildlife Habitat Using an 'Impact Risk' Mapping Technique." Paper presented at a Symposium on Classification, Inventory, and Analyses of Fish and Wildlife Habitat, Phoenix, Arizona, 1977 (hereafter cited as Thompson, "Critical Wildlife Habitat"); U.S. Departmet of Agriculture, Forest Service, "Some Basic Principles Concerning Biological Response to Environmental Change," by Michael S. Smith, I.L. Brisbin, Jr., and J.G. Weiner, in Selection, Management, and Utilization of Biosphere Reserves, U.S. Forest Service Report PNW82, 1979, pp. 105-122.

7. Thompson, "Critical Wildlife Habitat"; Clifford J. Martinka, "Mortality of Northern Montana Pronghorns in a Severe Winter," Journal of Wildlife Management 31(1) (1976), pp. 159-164.

8. S.L. Amstrup, "Effects of Coal Strip Minng on Habitat Use, Activities, and Population Trends of Sharp-tailed Grouse (Pedioecetes phasianellus)," unpublished progress report, Denver Wildlife Research Center, 1978; Olson-Elliott and Associates, "Terrestrial Fauna."

9. U.S. Department of Energy, Bonneville Power Administration, "Electrical and Biological Effects of Transmission Lines: A Review", Portland, Oregon, 1978; Montana Department of Natural Resources and Conservation, "Draft Environmental Statement on Anaconda-Hamilton 161 kv Transmission Line", Helena, Montana, 1976; Rural Electrical Associations, "Powerline Contacts by Eagles and Other Large Birds", Bulletin 61-10, 1978; U.S. Department of Agriculture, "Environmental Criteria for Electrical Transmission Systems" (Washington, DC: 1976); W.L. Anderson, "Waterfowl Collisions with Power Lines at a Coal-fired Power Plant", Wildlife Society Bulletin 6(2) (1978), pp. 77-83; D.S. Gilmer and J.M. Wiehe, "Nesting by Ferruginous Hawks and Other Raptors on High Voltage Powerline Towers", Prairie Naturalist 9(1) (1977), pp. 1-10; Wayne Milmine, Assistant Director, Livestock and Range Research Station, Miles City, Montana, personal communication.

10. Personal communication, Jon Swenson, Montana Department of Fish, Wildlife and Parks; Peter R. Martin, "Terrestrial Wildlife Habitat in Southeastern Montana," Montana Department of Fish, Wildlife and Parks, 1980.

A12.0 CULTURAL RESOURCES

A12.1 PROPOSED ACTION

A12.1.1 Construction

A12.1.1.1 Methods

Preparation of the cultural resource analysis was divided into two phases. Phase One consisted of a Class I inventory, or literature search, of all cultural resources previously located in the project area. Several inventories and site record data banks were consulted to prepare this list. These sources include: (1) the National Register of Historic Places; (2) the Montana Sites Compendium; (3) the University of Montana Archaeological Site Files; (4) the prehistoric and historic site files housed in the Bureau of Land Management offices in Billings and Miles City, Montana; (5) the Montana State Historic Preservation Office files in Helena.

All previous cultural resource surveys completed in or near the project area were assessed for information regarding cultural sites. In addition, a review of pertinent historical cartographic records--including General Land Office plat maps and U.S. Geological Survey maps--was conducted. Recent aerial photographs provided information concerning standing structures that then were compared to site locations indicated on the cartographic records. All sites within a corridor stretching one-half mile on either side of the proposed rail line's centerline, considering both the Ashland SE Alignment and the Ashland NW Alignment, were included in the assessment. Finally, on two occasions, limited field reconnaissance was conducted to confirm the presence and the character of selected sites in the route of the proposed rail line.

Three basic types of sites were identified during the Class I survey:

(1) Sites that have been recorded and evaluated. These sites have been formally evaluated against the National Register of Historic Places criteria and found to be eligible or ineligible for the Register.[1] An adverse impact to the resultant eligible sites would have to be avoided or mitigated where possible.

(2) Sites that have been recorded but not evaluated. Minimal field work has been completed regarding these sites and their precise locations may not be known. These sites would have to be evaluated for significance prior to any field disturbance.

(3) Predicted sites. These sites were assumed to be similar to those sites previously recorded in the study area.

Information from the first two site categories was used to develop a predictive model of site density. To determine the approximate number of archaeological sites that may be impacted by the construction of the proposed rail line, an estimate was made of prehistoric site densities, obtained from cultural resource surveys that had been conducted in the Tongue River Basin and near Colstrip (see Table A12-1).[2] This task involved examining 13 reports and extracting from them the areal extent of the surveyed lands in acres, and the number of cultural sites recorded.

Two important difficulties were encountered in attempting to estimate site densities. First, considerable variation exists in the way observers define a cultural resource site. Due to the preponderance of limited artifact clusters in southeastern Montana, archaeologists have chosen to address these marginal sites differently. For the current purposes, these limited artifact clusters have been given the same status as sites and are included in the totals shown in Table A12-1. Only those finds of single stone artifacts are excluded.

The second problem concerns the effective coverage of the ground surveyed. As survey methodologies have improved during the last decade, disparities in effective ground coverage have appeared between the early surveys and the more recent surveys. The recent surveys have attained better ground coverage and, as a result, have produced higher rates of site discovery. Where necessary, the site densities shown in Table A12-1 have been corrected to reflect likely discrepancies in survey methodology.

The corrected site densities range from 4 to 34 sites per 1,000 acres, averaging 16 sites per 1,000 acres. These figures are the equivalent of from 3 to 22 sites per section, with an average of 10 sites per section. Several factors influence the wide range of site density, including environmental differences between areas and the differences in recording methods between surveys. The average density calculated for this study is slightly higher than that density calculated for other studies.[3] This discrepancy probably reflects the high number of limited data loci, which may not have been considered in the antecedent studies.

Only five of the comprehensive, or 100-percent, surveys included National Register elegibility recommendations. Based on these studies' figures, significant sites comprise between 3 and 19 percent of the total, averaging 10 percent.

The recalibrated site densities have been used to estimate the direct impacts to prehistoric resources that may result from the construction of the proposed rail line. These predicted sites constitute the third category of cultural resources discussed in this report. They most likely would be of the same type as those cultural resources already found in the project area.

TABLE A12-1

PREVIOUS SURVEYS CONDUCTED IN THE STUDY AREA

SURVEY NAME	AREA	NO. OF SITES	NO. OF SITES PER 1,000 ACRES	COVERAGE	CORRECTED NO. OF SITES PER 1,000 ACRES	SITES EVALUATED AS NATIONAL REGISTER ELIGIBLE (ACTUAL TOTALS)[a]
Hanging Woman(1975)	12,800	17	1	35%	4	--
Otter Creek (1975)	11,840	49	4	35%	12	--
Pumpkin Creek	13,440	43	3	35%	9	--
CX Decker	6,200	68	11	70%	16	--
Tongue River	3,440	52	15	45%	34	--
Spring Creek Mine	4,005	81	20	100%	20	--
Kiewit-Whitney	1,320	32	24	100%	24	6 = 19%[b]
Bighorn	5,220	103	20	100%	20	3 = 3%[b]
Big Sky Mine	2,525	83	29	100%	29	10 = 12%
Montco	14,645	284	19	100%	19	19 = 7%
Hanging Woman(1980)	7,360	19	3	67%	4	--
CX Ranch	10,000	103	10	100%	10	20 = 19%
Otter Creek (1980)	8,640	114	13	100%	13	--

[a] Only surveys with 100-percent coverage are considered

[b] Includes some sites for which no evaluation is offered, but for which the authors reported, "May be likely to yield information important in prehistory"

Although several cultural resource surveys have been completed for the Tongue River Valley, only two of these adequately address historic resources; the remainder do not include historic sites in their analyses. These two studies are the inventories of historic resources for the Montco Mine and for the Consolidation Coal Company Mine.[4] The results from these surveys were reviewed to obtain, first, an average number of historic sites in relation to acreage and, second, an average ratio of eligible to ineligible sites (Table A12-2). It was determined that an average of two historic sites would be located for every 1,000 acres surveyed, and that approximately 22 percent of these located sites would be eligible for the National Register of Historic Places. These statistics have limited application due to the small size of the sample upon which they are based.

TABLE A12-2

SURVEYS OF HISTORIC RESOURCES IN THE PROJECT AREA

SURVEY NAME	AREA (acres)	NO. OF SITES	NO. OF SITES PER 1,000 ACRES	COVERAGE	SITES EVALUATED AS ELIGIBLE FOR NATIONAL REGISTER
Montco	14,645	16	1.1	100%	5
CX Ranch	10,000	24	2.4	100%	4
$\bar{x}$	--	--	1.75	--	9/40 = 22%

Some additional limitations are specifically pertinent to historic resources. For example, the absence of structural remains on an aerial photograph does not mean that other physical evidence of previous occupation--i.e., foundations, walls, cisterns, or root cellars--does not exist. In addition, it is impossible to determine, without an intensive survey, whether all of those structures present when the early land surveys were made were noted by the survey crews. Other possible historic remains--such as bridges, roads, and trails--were not always recorded accurately on early maps; the physical remains of these resources usually are difficult to discern from aerial photographs. Furthermore, neither is it generally possible to determine whether structures that were noted on both the historical maps and on the recent aerial photographs are the original sites located on historical maps, nor if the sites that appear on the aerial photographs would meet the eligibility requirements for listing on the National Register of Historic Places.

An unavoidable weakness of both the prehistoric and historic predictive models is that neither account for nonrandom distribution of sites. That is, environmental and/or social constraints that influence site location were not considered in calculating the average site densities. The kind of information needed to determine areas of high

and/or low site density within the greater project area is either not available from reports of surveys or is not presented in a standardized form that would allow comparison of data.

Phase Two of the cultural resource analysis involved a Class II survey, or field check, of all unrecorded and/or unevaluated sites identified during the Class I inventory survey. Although the primary purpose of Phase II field work was to verify sites identified, additional sites, found during field work, also were recorded. The majority of sites investigated during the Class II field work are historic sites identified from cartographic records. Several recorded but unevaluated prehistoric sites also were investigated. Only those sites within 1,500 feet either side of the centerline, a 3,000-foot corridor, were field checked.

Sixteen historic sites identified from historic documents could not be located during the second phase of field work. Many of these sites are roads and trails in the vicinity of Miles City. Given the amount of change that has taken place in the Miles City area, it is understandable that physical evidence of this type of site should be lacking.

Twenty-four additional historic sites and one prehistoric site were located during the second phase of field work. The field tasks for recording historic sites included completion of a plan view sketch map, and a site form that includes a verbal description of each feature and/or structure. Site forms had been completed for the prehistoric sites by previous investigators. Field tasks for this project involved completion of a site map and subsurface test pits, and recording any data that would supplement that found on the original site form. The time alloted for field reconnaissance was not sufficient to allow complete recording and mapping of all additional historic sites. Only sites with completed site forms and maps were submitted for Smithsonian numbers. The additional sites, located during the second phase of field work, if not assigned Smithsonian numbers, were given "TRR" numbers beginning with 101, to distinguish them from sites identified during the first phase. Information gathered during the Class II survey was used to evaluate sites against National Register eligibility criteria. It was possible to make a tentative recommendation of National Register eligibility for most sites. Only 10 sites, 5 prehistoric and 5 historic, remain unevaluated.

Sites that have formal determinations of eligibility (i.e., State Historic Preservation Office concurrence with recommendations of the recorder), should remain distinct from sites for which only preliminary recommendations have been made. Sites in the latter category are referred to as "probably eligible" for the National Register in the following sections of this report. Sites identified during the Class I inventory, but not located during the Class II inventory, are not included in the following analysis, nor are sites found outside the 3,000-foot study corridor.

A12.1.1.2 Prehistoric Site Types and Qualities of Significance

The most common site types likely to be found in the study area include: (1) lithic procurement sites; (2) lithic workshops; (3) campsites. A lithic procurement site refers to a site at which raw stone to be used in making tools was obtained. Lithic workshops represent areas where stone tool manufacture took place. Lithic workshops may be located at the raw material source (lithic procurement area), but often they are situated at a location more attractive for short term camping or game observation. The category of campsites includes open camps, tipi ring camps, and rockshelter habitations. At all such sites, artifacts are present which indicate a variety of maintenance activities--those geared toward fulfillment of nutritional and technological requirements.

In addition to these three main categories of prehistoric sites, a variety of sites representing specific extractive (subsistence) or ritual activities are found in the Tongue River Valley. For example, bison kill sites, where large numbers of bison were stampeded into natural or contrived traps, are common in the area. Rock art sites are also common. Burials, wooden habitations or fortifications, medicine wheels, and stone structures of various kinds including cairns, fortifications, eagle-watching pits, and vision quest structures are more limited in occurrence but may be present in the study area.

Prehistoric sites of all kinds are most often determined to be eligible for the National Register because of their ability to yield further significant information to the prehistory of the study area. The most important quality that prehistoric sites must exhibit in order to be determined eligible is depositional integrity. Without this, the data retrieved from a site has no context for analysis.

A12.1.1.3 Historic Site Types and Qualities of Significance

Historic site types in the study area include: (1) battle and military activity sites dating to the 1860s and 1970s; (2) ranching complexes and line camps; (3) roads, bridges, and railroads; (4) homesteads.

Historic sites may qualify for the National Register for a variety of reasons. Most often, however, historic sites are determined eligible for the Register because of their historic associations and/or architectural values. This determination depends upon the character of site remains. For example, a cattle ranch dating to the 1890s, with intact structures and good integrity of materials, workmanship, and design, etc., may be eligible for the National Register because it represents an important phase in the economic development of the study area. The same site also may exhibit unique or representative architectural values. Either of these qualities (i.e., historic associations or architectural value) would qualify a site for placement on the National Register.

In some cases, sites may be determined eligible because of their potential to yield further significant historical information. Generally, the physical remains at sites in this category would consist of foundation remains and other features (i.e., privies, wells, etc.), although sites with standing structures may be included. Excavation of this type of site (data retrieval) may yield information concerning the ethnic or regional affiliation of the site's occupants, economic conditions and pursuits, and stability or change in social values.

The values associated with a particular site (i.e., architectural, historical, or information potential) will affect the ability to mitigate against adverse impact. For example, removal of physical remains from a site which has been determined eligible for the National Register due to its historic associations will destroy the historic association and thus its quality of eligibility. Mitigation against damage to the historic association of a site is not possible. On the other hand, adverse impact to the information potential of a site can be mitigated through a data recovery program based upon current accepted professional techniques and a knowledge of the historic data base.

The values or qualities of significance of each eligible site, prehistoric or historic, must be clearly defined in order to determine whether or not mitigation of different types.

A12.1.1.4 Impacts

The impacts to National Register of Historic Places eligible sites can be either direct or indirect. A direct impact to a site located in the project area can occur in two ways: (1) the destruction or the removal of a site in the right-of-way, caused by the construction of the grade; (2) a construction-related visual or audible impact to a site beyond the right-of-way, but within the 3,000-foot corridor (1,500 feet either side of the centerline). An indirect impact to a site could result from altering land use patterns or from increasing public accessibility to previously remote areas. Indirect impacts are not expected to extend to either side of the centerline more than 1,500 feet, but would be contained in the 3,000-foot corridor.

Direct Impacts

Table A12-3 lists the prehistoric and historic sites that lie within the right-of-way of the proposed rail line. Two prehistoric sites--24RB224 and 24RB228--would be impacted directly by construction. However, only site 24RB228 is eligible for the National Register of Historic Places. Site 24RB224 has been determined ineligible and, therefore, it need not be considered further in the planning process.

Two historic sites--24CR360 and TRR-121--are located in the right-of-way. Site 24CR360 is an occupied log homestead complex with

TABLE A12-3

CULTURAL RESOURCE SITES LOCATED WITHIN THE RIGHT-OF-WAY
PROPOSED ACTION

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER ELIGIBILITY STATUS
24RB224	Lithic Procurement	Unknown	Ineligible
24RB228	Campsite	Unknown	Eligible
24CR360	Log Homestead Complex	Historic	Probably eligible
TRR-121	Frame Ranch House (McGregor place)	Historic	Unrecorded Unevaluated

several intact structures. It is probably eligible for nomination to the National Register of Historic Places. Site TRR-121 is a vacant frame ranch house that has not been completely recorded and evaluated for National Register eligibility.

Using the predictive model discussed in section 12.1.1.1, 29 prehistoric sites are projected to be found within the proposed rail line's right-of-way. Ten percent of these prehistoric sites may be eligible, based on the average rate of eligible to ineligible sites. Therefore, the construction of the proposed rail line's right-of-way directly could impact two to three National Register eligible prehistoric sites. As noted, one eligible site (24RB228) already has been recorded.

Four historic sites are projected to be located during a systematic survey of the proposed rail line's alignment. Since two sites are known to lie within the right-of-way, an additional two sites may be encountered, based on projected probabilities. One of these historic sites probably would be eligible for listing on the National Register of Historic Places.

Fifteen prehistoric sites have been located within the 3,000-foot corridor, exclusive of sites in the right-of-way itself (see Table A12-4). Only one of these sites has not been evaluated for significance using the National Register criteria. This site, 24PR1150, is a campsite of unknown cultural affiliation.

Based upon work done by Historical Research Associates (Missoula, Montana) and/or archaeologists for the Miles City District Office of the Bureau of Land Management, nine sites have been assigned tentative National Register eligibility recommendations. Six sites are probably eligible for the National Register. These include a Late Prehistoric bison jump, a Middle Plains Archaic tool cache, and four campsites, one of which contains a stone circle. The three remaining sites--one

TABLE A12-4

PREHISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF CENTERLINE)
PROPOSED ACTION

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER STATUS
24CR50	Bison Jump	Late Prehistoric	Probably eligible
24PR30	Stone Circle Campsite	--	Probably eligible
24PR568	Campsite	--	Probably eligible
24PR1150	Campsite	--	Probably eligible
24RB219	Lithic Procurement	--	Ineligible
24RB220	Campsite	--	Ineligible
24RB221	Campsite	Middle and Late Plains Archaic	Eligible
24RB222	Lithic Workshop	--	Ineligible
24RB225	Campsite	--	Ineligible
24RB896	Campsite	--	Probably ineligible
24RB904	Open campsite	Late Prehistoric	Probably eligible
24RB1225	Tool Cache	Middle Plains Archaic	Probably eligible
24RB1230	Campsite	Late Prehistoric	Probably ineligible
24RB1232	Lithic Workshop	--	Probably ineligible
24RB1233	Campsite	--	Probably eligible

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 15

[a] Exclusive of sites within the right-of-way

lithic workshop and two campsites--are probably ineligible for nomination to the National Register.

Formal determinations of eligibility have been made for five sites. Four of these were found to be ineligible, and one was determined eligible for the National Register. The ineligible sites include a lithic procurement site, a lithic workshop, and two campsites. The single eligible site (24RB221) is a Middle and Late Plains Archaic campsite. It is unlikely that this site would be adversely affected by vibration from construction activities or by visual or audible impacts. Site 24RB1225, a Middle Plains Archaic tool cache, is also included in Table A12-4. All material from the cache has been removed; however there may be additional subsurface cultural remains

at the site. For this reason, the site is included in the "probably eligible" category. Only deep testing of the site area will determine the presence or absence of further cultural material.

Twenty-one historic sites are located within the 3,000-foot corridor of the proposed rail line (see Table A12-5). Three of these sites (TRR-116, TRR-117, and TRR-119) remain unevaluated. All three are ranch complexes with a number of standing structures. Fifteen sites have been given preliminary National Register eligibility recommendations. Seven sites are probably eligible. These include sites TRR-20, TRR-22, and 24CR359, all of which are ranch complexes; TRR-110, the Willow Crossing School; TRR-120, the abandoned Milwaukee Road railroad station and yard; TRR-201 and TRR-202, both of which are Northern Cheyenne Indian dwellings. These two sites may eventually be included in a district nomination, including the St. Labre mission and school located just north of Ashland. All seven "probably eligible" sites contain standing structures and would be susceptible to visual and audible impacts. Eight sites are probably ineligible for the Register. Six of these eight sites (24CR363, 24PR273, TRR-56, TRR-109, TRR-112, and TRR-113) are ranch complexes with standing structures, and two sites (24RB901 and TRR-111) contain foundations only. Three sites have formal determinations of eligibility. Sites 24RB166, a vacant ranch, and 24RB171, a railroad grade, are ineligible for the Register. One site, the Miles City Water Treatment Plant (TRR-6), is listed on the National Register of Historic Places. This site is located approximately 150 yards from the abandoned Milwaukee Road rail line. It is buffered from visual and audible impacts by a grove of trees, and should not be impacted by construction of the proposed rail line's right-of-way.

If any of the unevaluated sites are determined eligible for the National Register, or if additional significant sites are encountered (particularly those sites with standing structures), they could be affected by visual and audible impacts. In each case, the probability of impact would depend upon the location of the resource, and whether or not it were buffered by trees or topography from the proposed rail line.

Indirect Impacts

The construction of the proposed rail line may create changes in land use patterns, thus providing access to previously remote areas. In such cases, individuals consciously or unconsciously may impact cultural resource sites by vehicle use and by the casual collecting of artifacts. Those National Register eligible prehistoric and historic sites within the 3,000-foot corridor of the proposed rail line could be subjected to this type of indirect impact.

TABLE A12-5

HISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF THE CENTERLINE)
PROPOSED ACTION

SITE NO.	SITE TYPE	NATIONAL REGISTER STATUS
TRR-6	Water Treatment Plant	Eligible (buffered by trees)
TRR-20	Farm Ranch House and outbuildings	Probably eligible (buffered by trees and Tongue River)
TRR-22	Occupied Log Ranch House	Probably eligible (buffered by trees and Tongue River)
24CR359	Log Ranch House and outbuildings	Probably eligible (no existing buffer)
24CR363	Occupied Ranch Complex and Schoolhouse	Probably ineligible
24PR273	Vacant Ranch Complex (house burned down)	Probably ineligible
TRR-56	Occupied Ranch Complex; one sandstone structure	Probably ineligible
24RB166	Vacant Ranch Complex	Ineligible
24RB171	North-South Railroad Grade	Ineligible
24RB901	Foundations only	Probably ineligible
TRR-109	Abandoned homestead complex with occupied trailer	Probably ineligible
TRR-110	Willow Crossing School	Probably eligible (no existing buffer)
TRR-111	Foundations only	Probably ineligible
TRR-112	Occupied Ranch Complex (Haley Ranch)	Probably ineligible
TRR-113	Occupied Ranch	Probably ineligible
TRR-116	Occupied Ranch Complex	Undetermined
TRR-117	Occupied Ranch Complex	Undetermined
TRR-119	Ranch Complex	Undetermined
TRR-120	Milwaukee Road Station and railroad yard	Probably eligible
TRR-201	Martin Two Bulls' House	Probably eligible
TRR-202	Julia Fire Crow's Residence	Probably eligible

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 21

[a] Exclusive of sites within the right-of-way

A12.1.1.5 Mitigative Measures

The proposed rail line has not been surveyed intensively along its entire route. The first task in assessing any impact to National Register eligible properties would be to conduct such an intensive field survey, prior to railroad construction. The results of this survey would provide the basis for evaluation of individual sites against the National Register criteria.

For those cultural properties determined eligible for listing on the National Register, both assessments of effect and impact mitigation plans would be established by the Interstate Commerce Commission, in consultation with the President's Advisory Council on Historic Preservation and with the Montana State Historic Preservation Office.[5]

Some significant cultural resources may not be visible during the pedestrian survey, but may be uncovered in the process of construction. The best way to alleviate any adverse impacts on previously unidentified properties that would be exposed during construction of the rail line would be to develop and operate a monitoring program during the construction period. The need for construction monitoring at specific points (e.g., major stream crossings) can be assessed on the basis of the intensive survey results. The mitigation of impacts upon those properties not identifiable during the pedestrian survey, but discovered during construction activities, would follow the special procedure outlined in 36 CFR §800.7.

Plans to mitigate for a direct physical impact might include avoidance, or in-place preservation, or data recovery responsive to defined and defensible research questions. For prehistoric sites, data recovery measures usually involve the surface collection and/or the excavation of cultural materials, as well as the collection of pertinent environmental data, to be analyzed according to a predetermined research design. The mitigation of an adverse impact to a historic site with standing structures would include the extensive documentation with photographs, with complete architectural drawings that conform to the guidelines of the Historical American Buildings Survey, and with the collection of construction material samples. This type of data retrieval cannot, however, mitigate for the destruction of the historic association connected with a site, which results from destruction of physical remains. Impacts to those types of cultural resources found in the project area generally can be mitigated by means of data recovery; however, in-place preservation or avoidance may be necessary for some types of sites.

The potential impact to sites resulting from construction machinery vibration may be mitigated by several stabilization measures designed to obviate or minimize this impact. Direct visual and audible impacts to cultural properties are not mitigated easily. However, such barriers as tree buffers may alleviate most visual and audible impacts.

Mitigation plans for an indirect impact on a National Register eligible site may include the periodic monitoring of that site to determine the extent of impact. The effective management of contruction crews also can assist in mitigating any indirect impacts.

A12.1.2 Operation and Maintenance

The site type most likely to be impacted by the operation of the proposed railroad is the historic site with standing structures. For example, vibrations from passing trains can loosen the chinking and the planking of log structures. Visual and audible impacts, unless buffered by topography or vegetation, also can disrupt the historic association of a site and, thereby, can affect its National Register eligibility. However, the potential impact zone generally would not extend beyond the 3,000-foot corridor (i.e., 1,500 feet to either side of centerline) established for this analysis. In most cases, vibrations, visual impacts, and audible impacts would be reduced or eliminated by naturally occurring vegetative or topographic buffers.

Twelve sites with standing structures were identified during the Class I literature search. After the Class II field survey, 1[illegible] sites with standing structures were found to lie within 1,500 feet on either side of the proposed right-of-way. The predictive model discussed in section A12.1.1.1 indicates that approximately 22 percent of these sites (between three and four sites) may be National Register eligible. However, preliminary evaluations of sites investigated during the Class II survey indicate that six sites (38 percent) with standing structures are probably eligible for nomination to the National Register. The difference between the projected number of eligible sites, and the actual number encountered during field work, is due in part to the character of the proposed corridor. The factors that attracted the first ranchers to the Tongue River drainage (i.e., accessibility to water, flat land for crops, and pasturage, etc.) have remained fairly constant up to the present. As a result, it is not uncommon to find homestead or ranch sites that have been more or less continuously occupied since the 1890s and early 1900s. These sites often exhibit good integrity of function, setting, and design, thus qualifying them for inclusion on the National Register of Historic Places.

Topographic and/or vegetative buffers most likely would shield historic homestead sites from visual impacts and from audible impacts. The topography of the area is heavily broken and deserted benchland, which aids in masking visual intrusions. Also, many homestead sites retain the vegetative buffers established by the original homesteaders. A viable mitigative measure, applied to reduce or to eliminate visual impacts and audible impacts to a National Register eligible site, is to establish tree buffer zones at that site, if those zones are not naturally present. Further, vibration impacts would depend on the proximity of a structure to the railroad. Various stabilization techniques may be used to mitigate vibration impacts.

The Miles City Water Treatment Plant, listed on the National Register of Historic Places, lies within the 3,000-foot corridor of the proposed rail line. It is located approximately 150 yards from the abandoned Milwaukee Road right-of-way, and is buffered from the rail line's visual and audible impacts by a grove of trees. This site should not be impacted by the operation of the proposed railroad.

Three of the five remaining sites thought to qualify for the National Register (TRR-20, TRR-22, and 24CR359) have topographic or vegetative features protecting them from the proposed railroad's centerline. Two sites (TRR-110 and TRR-120) have no existing buffer. However, TRR-120, the Milwaukee Road Station, should not be adversely impacted by operation and maintenance of the proposed railroad, since the original function of the Station is directly associated with railroad activity.

A12.1.3 Related Actions

The development of coal mines that would be served by the Tongue River Railroad could directly impact cultural sites eligible for listing on the National Register of Historic Places. The precise number of those National Register eligible sites that might be impacted cannot be determined prior to the intensive survey required by state and federal regulations.[6] However, one can estimate the number of potentially impacted sites by using the same site density projections that are discussed in section A12.1.1.1.

A12.1.3.1 Projected Impacts to Prehistoric Sites

The projected impacts to prehistoric sites assume the operation of five coal mines, functioning under the high coal production scenario. Under these conditions, as many as 500 sites may be impacted as a result of coal development in that area to be serviced by the Tongue River Railroad. Of these 500 sites, an estimated 10 percent, or 50 prehistoric sites, might be eligible for the National Register (see Table A12-6). Available survey data indicate that most of these National Register eligible sites would be similar to those sites found along the route of the proposed railroad (see Tables A12-3 and A12-4). In many of these cases, the mitigation of any adverse impacts by means of the data recovery method would be appropriate.

A12.1.3.2 Projected Impacts to Historic Sites

Based upon the same projection of five mines, 63 historic sites may be affected by coal mining. Fourteen of these sites might be eligible for the National Register of Historic Places (see Table A12-6). As stated previously, more eligible sites were identified during the Class II survey of the proposed railroad's 3,000-foot corridor than had been predicted from the predictive model. Mine development will cross-cut a much more diverse topographic and ecologic area, therefore a lower estimate of site density and eligibility, similar to that of the predictive model (see section A12.1.1.1), is appropriate.

TABLE A12-6

PROJECTED IMPACTS TO PREHISTORIC AND HISTORIC SITES
FROM RELATED ACTIONS: PROPOSED ACTION

IMPACT[a]	MONTCO PLUS 4 OTHER MINES LOW SCENARIO	MEDIUM SCENARIO	HIGH SCENARIO
Disturbed Acreage	25,889	29,999	31,349
Probable Cultural Resource Sites			
Prehistoric	415	480	500
Historic	52	60	63
Probable National Register Sites			
Prehistoric	42	48	50
Historic	11	13	14

[a] The impacts are projected to be identical, regardless of which options are followed within each alternative

Mitigative measures for direct and indirect impacts to historic resource sites are the same as those measures discussed in section A12.1.1.5. Available data suggest that most National Register eligible sites could generally be mitigated by means of the data recovery method. However, sites which qualify because of their historic associations and/or architectural values may have to be preserved in-place or avoided.

A12.2 TONGUE RIVER ROAD ALTERNATIVE

A12.2.1 Construction

The methods used to identify the cultural resources along the Tongue River Road alternative route are the same as those methods employed for the analysis of the proposed rail line (see section A12.1.1.1).

A12.2.1.1 Impacts

Direct Impacts

Three prehistoric sites are located within the total Tongue River Road alternative right-of-way (see Table A12-7). Only one of these sites (24CR62), is specific to the Tongue River Road alternative

TABLE A12-7

CULTURAL RESOURCE SITES IN THE RIGHT-OF-WAY
TONGUE RIVER ROAD ALTERNATIVE

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER ELIGIBILITY STATUS
24CR62	Lithic Workshop	Unknown	Probably ineligible
24RB224	Lithic Procurement	Unknown	Ineligible
24RB228	Campsite	Unknown	Eligible
24CR362	Garland School	Historic	Probably ineligible

route. This site is a lithic workshop that is probably ineligible for nomination to the National Register. The two remaining sites (24RB224 and 24RB228) are located within the right-of-way of the proposed rail line and are discussed in section A12.1.1.4.

One historic site specific to this alternative is located within the Tongue River Road alternative right-of-way (see Table A12-7). Site 24CR362, the Garland School, is still in use, and is probably ineligible for the National Register. No additional historic sites would be found along the Tongue River Road alternative route when the optional route through Ashland is considered. Using the site density estimates from Table A12-1, a projected 31 prehistoric sites could be located in this right-of-way. Three sites already have been recorded. Three of the projected 31 prehistoric sites could be eligible for nomination to the National Register. One eligible site already has been recorded.

Four or five projected historic sites may be located within the right-of-way of the Tongue River Road alternative route. One site already has been located. Of the projected four or five historic sites, possibly one would be eligible for nomination to the National Register of Historic Places.

Direct impacts to those sites beyond the right-of-way, but, within the 3,000-foot corridor, would be the same as those impacts discussed for the proposed rail line (see section A12.1.1.4). Twelve prehistoric sites have been located within the 3,000-foot corridor of the Tongue River Road alternative route (see Table A12-8). Only two of these (24CR157 and 24CR158) are specific to this alternative. Site 24CR157 is a lithic workshop of unknown cultural affiliation. Site 24CR158 is a campsite, also of unknown cultural affiliation. Both sites are probably ineligible for nomination to the National Register. The remaining sites are discussed in terms of the proposed rail line (see section 12.1.1.4).

TABLE A12-8

PREHISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF CENTERLINE)
TONGUE RIVER ROAD ALTERNATIVE

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER STATUS
24CR50	Bison Jump	Late Prehistoric	Probably eligible
24CR157	Lithic Workshop	--	Probably ineligible
24CR158	Lithic Procurement	--	Probably ineligible
24PR30	Stone Circle	--	Probably eligible
24PR568	Campsite	--	Probably eliglble
24PR1150	Campsite	--	Unevaluated
24RB219	Lithic Procurement	--	Ineligible
24RB220	Campsite	--	Ineligible
24RB221	Campsite	Middle and Late Plains Archaic	Eligible
24RB222	Lithic Workshop	--	Ineligible
24RB225	Campsite	--	Ineligible
24RB904	Open campsite	Late Prehistoric	Probably eligible

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 12

[a] Exclusive of sites within the right-of-way

Thirty-eight historic sites lie within the 3,000-foot corridor of the Tongue River Road alternative route (see Table A12-9). Twenty-three of these are specific to this alternative. They include: TRR-21; 24CR352; 24CR353; 24CR354; 24CR355; 24CR356; 24CR357; 24CR358; 24CR361; 24CR364; 24CR365; 24RB900; 24RB902; TRR-101; TRR-102; TRR-103; TRR-104; TRR-105; TRR-106; TRR-107; TRR-108; TRR-115; TRR-118. One site, TRR-118, a ranch, has not been recorded or evaluated against National Register eligible criteria. Site 24CR361 is probably eligible for nomination to the National Register of Historic Places. This site contains foundations only, but may be the remains of Piper Dan's Stage Station. "Piper Dan" operated one of the first stage stations along the Tongue River Road. Sites 24CR352 and 24RB900 are also probably eligible for the National Register.

TABLE A12-9

HISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF CENTERLINE)
TONGUE RIVER ROAD ALTERNATIVE

SITE NO.	SITE TYPE	NATIONAL REGISTER STATUS
TRR-6	Treatment Plant	Eligible
TRR-21	Bulldozed Homestead (only privy remains)	Probably ineligible
24CR352	Vacant Frame Homestead	Probably eligible
24CR353	Vacant Ranch Complex (some log buildings)	Probably ineligible
24CR354	Occupied Ranch Complex	Probably ineligible
24CR355	Schoolhouse	Probably ineligible
24CR356	Log Ranch House and outbuildings	Probably ineligible
24CR357	Trash dump and remains of homestead	Probably ineligible
24CR358	Ranch house and outbuildings	Probably ineligible
24CR361	Foundations only ("Piper Dan's Stage Station")	Probably eligible
24CR364	Occupied log ranch house and outbuildings	Probably ineligible
24CR365	Garland Store homestead buildings	Probably ineligible
24PR273	Vacant Ranch Complex (house burned down)	Probably ineligible
TRR-56	Occupied Ranch Complex (one sandstone slab building)	Probably ineligible
24RB166	Vacant Ranch Complex	Ineligible
24RB171	Railroad grade	Ineligible
24RB900	Occupied Log Homestead Complex (Flowers Ranch)	Probably eligible
24RB902	Vacant Ranch Complex (some log buildings)	Probably ineligible
TRR-101	Abandoned Homestead (shacks)	Probably ineligible
TRR-102	Corrals and log cattle shed	Probably ineligible
TRR-103	Homestead - 2 abandoned log buildings	Probably ineligible
TRR-104	Collapsed frame house with 3 log outbuildings	Probably ineligible
TRR-105	Historic Grave	Probably ineligible
TRR-106	Abandoned log 1-1/2-story house with grave--"Goodal"	Probably ineligible
TRR-107	Occupied "Bale" Ranch	Probably ineligible
TRR-108	2 Frame homestead shacks	Probably ineligible
TRR-109	Abandoned Homestead Complex with occupied modern trailer	Probably ineligible
TRR-110	Willow Crossing School	Probably eligible

[a] Exclusive of sites within the right-of-way

TABLE A12-9. HISTORIC SITES WITHIN 3,000-FOOT CORRIDOR (continued)

SITE NO.	SITE TYPE	NATIONAL REGISTER STATUS
TRR-111	Foundation only	Probably ineligible
TRR-112	Occupied Ranch house (Haley's Ranch)	Probably ineligible
TRR-113	Occupied Ranch	Probably ineligible
TRR-115	Abandoned Ranch-log and frame structure	Probably ineligible
TRR-116	Occupied Ranch (Otter Creek-Trusler)	Undetermined
TRR-117	Occupied Ranch (Otter Creek-Trusler)	Undetermined
TRR-118	Ranch house	Undetermined
TRR-120	Milwaukee Station and railroad yard	Probably eligible

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 36

The remaining 21 sites exclusive to this alternative route have been recorded and evaluated, and are probably ineligible for the National Register. These include 16 sites with standing structures (one of which has an associated grave), 2 sites with features only, and 1 historic grave. The remaining 15 sites also are located along the route of the proposed rail line, and are discussed in section A12.1.1.4. One of these (TRR-6) has been formally determined eligible for listing on the National Register of Historic Places. Four sites--the Willow Crossing School (TRR-110), the Milwaukee Road Station (TRR-120), Martin Two Bulls' house (TRR-201), and Julia Fire Crow's residence (TRR-202)--are probably eligible. Both TRR-201 and TRR-202 are Northern Cheyenne Indian dwellings, and may eventually be included in a district nomination, including the St. Labre Indian mission and school.

Indirect Impacts

The indirect impacts associated with the construction of the Tongue River Road alternative route would be the same as those impacts discussed for the proposed rail line (see section A12.1.1.4). National Register eligible sites located within the 3,000-foot corridor of the alternative route may be impacted by the construction of this rail line.

A12.2.1.2 Mitigative Measures

The mitigative measures for those adverse impacts generated along this alternative would be the same as those measures discussed for the proposed rail line (see section A12.1.1.4).

A12.2.2 Operation and Maintenance

As discussed in section A12.1.2, the operation and maintenance of the proposed railroad would most likely impact those historic sites

which include standing structures. Thirty-two such sites are located within the 3,000-foot study corridor of the Tongue River Road alternative. Of these 32 sites, only the Miles City Water Treatment Plant (TRR-6) is known to be eligible for listing on the National Register. This site would not be impacted by the operation of the railroad. Six additional sites with structures--24CR352, 24RB900, TRR-110,TRR-120, TRR-201, and TRR-202--are probably eligible for the National Register. Site TRR-120, the Milwaukee Station and the Milwaukee Road yards, would not be impacted by the railroad, since railroad activity is consistent with the site's original function. Site TRR-110, the Willow Crossing School, may be adversely impacted by operation and maintenance of the railroad, since the site has no existing buffer. Two of the sites--24RB900 and 24CR352--are unique to the Tongue River Road alternative route. Site 24RB900 is protected from visual and audio impacts by a topographic feature. Site 24CR352 would be subject to visual and audio impacts because no buffers currently exist that would mitigate the impact.

A12.2.2.1 Mitigative Measures

The mitigation of those impacts caused by the operation and by the maintenance of a railroad along the Tongue River Road alternative route would be the same as that mitigation discussed for the proposed rail line (see section A12.1.2).

A12.2.3 Related Actions

The impacts to cultural resources and the mitigative measures for the related actions associated with the Tongue River Road alternative route are the same as those impacts and measures discussed for the proposed rail line (see section A12.1.3).

A12.3 MOON CREEK ALTERNATIVE

A12.3.1 Construction

The methods used to identify cultural resources along the Moon Creek alternative route are the same as those methods employed for the analysis of the proposed rail line (see section A12.1.1.1).

A12.3.1.1 Impacts

Direct Impacts

Five prehistoric sites lie within the total right-of-way of the Moon Creek alternative route (see Table A12-10). Three of these sites--24CR154, TRR-2, and TRR-4--are exclusive to this alternative. None have been evaluated against National Register eligibility criteria. The other two sites (24RB224 and 24RB228) also lie within the

TABLE A12-10

CULTURAL RESOURCE SITES IN THE RIGHT-OF-WAY
MOON CREEK ALTERNATIVE

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER STATUS
24CR154	Campsite	Unknown	Unevaluated
24CR360	Log Homestead Complex	Historic	Prob. Eligible
24RB224	Lithic procurement	Unknown	Ineligible
24RB228	Campsite	Unknown	Eligible
TRR-2	Campsite	Unknown	Unevaluated
TRR-4	Campsite	Unknown	Unevaluated
TRR-121	Frame Ranch House (McGregor)	Historic	Unevaluated and Unrecorded

right-of-way of the proposed rail line and are discussed in section A12.1.1.4. Two historic sites--TRR-121 and 24CR360--lie in the right-of-way of the Moon Creek alternative route. They also lie in the right-of-way of the proposed rail line and are discussed in section A12.1.1.4.

The construction of the Moon Creek alternative route would disturb approximately 1,301 acres. Using the acreage figure and the predictive model for prehistoric site density (see Table A12-1), one would expect to find approximately 21 prehistoric sites located within the Moon Creek Alternative's right-of-way. Five sites have already been identified. Approximately two (10 percent) of these sites might be eligible for nomination to the National Register of Historic Places; site 24RB228 already had been determined eligible. In addition to the located site TRR-121, two to three historic sites predictively, would be located in the course of a survey of the Moon Creek alternative route. Possibly one of these sites would be eligible for nomination to the National Register of Historic Places.

Direct impact to sites beyond the right-of-way but within the 3,000-foot study corridor resulting from construction of the Moon Creek alternative route would be the same as those impacts caused by the proposed rail line (see section A12.1.1.4). Sixteen sites lie within 1,500 feet of the Moon Creek alternative centerline (Table A12-11). Two of these sites (TRR-1 and TRR-3) are specific to the Moon Creek alternative route. Both sites are unevaluated campsites. The remaining 14 sites occur along the route of the proposed rail line and are discussed under section A12.1.1.4.

Site 24RB221 has formally been determined eligible for the National Register. Five sites, 24PR30, 24PR568, 24RB904, 24RB1225, and

TABLE A12-11

PREHISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF CENTERLINE)
MOON CREEK ALTERNATIVE

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER STATUS
24PR30	Tipi ring Camp	--	Probably eligible
24PR1150	Campsite	--	Unevaluated
24PR568	Campsite	--	Probably eligible
24RB219	Lithic Procurement	--	Ineligible
24RB220	Campsite	--	Ineligible
24RB221	Campsite	Middle and Late Plains Archaic	Eligible
24RB222	Lithic Workshop	--	Ineligible
24RB225	Campsite	--	Ineligible
24RB896	Campsite	--	Probably ineligible
24RB904	Open campsite	Late Prehistoric	Probably eligible
24RB1225	Tool Cache	Mid. Plains Archaic	Probably eligible
24RB1230	Campsite	Late Prehistoric	Probably ineligible
24RB1232	Lithic Workshop	--	Probably ineligible
24RB1233	Campsite	--	Probably eligible
TRR-1	Campsite	--	Unevaluated
TRR-3	Campsite	--	Undetermined

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 16

[a] Exclusive of sites within the right-of-way

24RB1233, are probably eligible. None of these sites are likely to be impacted by construction of the Moon Creek alternative route.

Eighteen historic sites lie within the 3,000-foot corridor of the Moon Creek alternative (Table A12-12). Only one of these sites, a petroglyph (TRR-8) is specific to this alternative route. The site has not been evaluated against National Register eligibility criteria. The remaining sites all occur along the route of the proposed rail line. Of the 15 remaining sites, TRR-10 (the Willow Crossing School), 24CR359, TRR-201, and TRR-202 are probably eligible for the National Register. Both sites TRR-201 and TRR-202 are Northern Cheyenne Indian dwellings, and may be included on a district nomination, including St. Labre Indian mission and school. These sites appear to be buffered from visual and audible impacts by topographic features. The Willow Crossing School and 24CR359 have no existing topographic or vegetative buffer to mitigate against adverse visual and audible impacts.

TABLE A12-12

HISTORIC SITES LOCATED WITHIN THE 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF THE CENTERLINE)
MOON CREEK ALTERNATIVE

SITE NO.	SITE TYPE	NATIONAL REGISTER STATUS
TRR-8	Petroglyph	Unevaluated
24CR359	Log Ranch and Buildings	Probably eligible (no existing buffer)
24CR363	Occupied Ranch Complex and Schoolhouse	Probably ineligible
24PR273	Vacant Ranch Complex (house burned down)	Probably ineligible
TRR-56	Occupied Ranch Complex (one sandstone structure)	Probably ineligible
24RB166	Vacant Ranch Complex	Ineligible
24RB171	North-South Railroad Grade	Ineligible
24RB901	Foundations only	Probably ineligible
TRR-109	Abandoned homestead complex with occupied trailer	Probably ineligible
TRR-110	Willow Crossing School	Probably eligible (no existing buffer)
TRR-111	Foundations only	Probably ineligible
TRR-112	Occupied Ranch Complex (Haley Ranch)	Probably ineligible
TRR-113	Occupied Ranch	Probably ineligible
TRR-116	Occupied Ranch Complex	Undetermined
TRR-117	Occupied Ranch Complex	Undetermined
TRR-119	Ranch Complex	Undetermined
TRR-201	Martin Two Bull's House	Probably eligible (Buffered by topography)
TRR-202	Julia Fire Crow's Residence	Probably eligible (Buffered by topography)

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 18

[a] Exclusive of sites within the right-of-way

Indirect Impacts

The indirect impacts associated with the construction of the Moon Creek alternative route would be the same as those impacts discussed for the proposed rail line (see section A12.1.1.4). National Register eligible sites located within the 3,000-foot corridor of the Moon Creek alternative route may be impacted by the construction of this rail line.

A12.3.1.2 Mitigative Measures

The mitigative measures for those adverse impacts caused by the construction of the Moon Creek alternative route would be the same as those measures discussed for the proposed rail line (see section 12.1.1.4).

A12.3.2 Operation and Maintenance

As discussed in section A12.1.2, the operation and maintenance of the proposed railroad most likely would impact those historic sites which contain standing structures. Thirteen such sites are located within the 3000-foot study corridor of the Moon Creek alternative route. Applying the predictive percentage of National Register eligible sites to this number indicates that 3 of the 13 sites would be eligible for the National Register. Four of the sites with standing structures (TRR-110, 24CR359, TRR-201, and TRR-202) have been recommended as probably eligible for the National Register and may be impacted by the operation of the railroad. Three sites (TRR-116, TRR-117, and TRR-119) along this route remain unevaluated. One of these unevaluated sites may be determined eligible for the National Register, given the findings of the predictive model.

The possible impacts to National Register eligible sites would depend upon the same factors that are discussed for the proposed rail line (see section A12.1.2). The possible impacts to these sites similarly would be functions of their location and of the presence of vegetative and topographic buffers. Site TRR-110 has no such buffer.

In addition to the sites with standing structures, the historic petroglyph (TRR-8) located along this alternative, if recommended as eligible for nomination to the National Register, may be adversely affected by operation and maintenance of the railroad.

A12.3.2.1 Mitigative Measures

The mitigative measures for those adverse impacts to cultural resources resulting from the operation and the maintenance of a railroad along the Moon Creek alternative route would be the same as those measures for the proposed rail line (see section A12.1.2).

A12.3.3 Related Actions

The impacts to cultural resources and the mitigative measures for the related actions associated with the Moon Creek alternative are the same as those impacts and measures for the proposed rail line (see section A12.1.3).

A12.4 COLSTRIP ALTERNATIVE

A12.4.1 Construction

The methods used to identify the cultural resources along the Colstrip alternative route are the same as those methods employed for the analysis of the proposed rail line (see section A12.1.1.1).

A12.4.1.1 Impacts

Direct Impacts

Two prehistoric sites are located within the total right-of-way of the Colstrip alternative route (see Table A12-13). These two sites (24RB224 and 24RB228) also lie in the right-of-way of the proposed rail line and they are discussed in section A12.1.1.4. No known historic sites are situated within the right-of-way of the Colstrip alternative route.

TABLE A12-13

CULTURAL RESOURCE SITES IN THE RIGHT-OF-WAY
COLSTRIP ALTERNATIVE

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER STATUS
24RB224	Lithic Procurement	Unknown	Ineligible
24RB228	Campsite	Unknown	Eligible

Using the predictive model for prehistoric site density (see Table A12-1), one would expect to find about 18 prehistoric sites located within the Colstrip alternative right-of-way. Two sites already have been recorded. Approximately 10 percent, or two of these sites may be eligible for nomination to the National Register of Historic Places. Site 24RB228 already has been determined eligible.

Two or three historic sites predictively would be located in the course of a survey of the Colstrip alternative route. Possibly one of these sites would be eligible for nomination to the National Register of Historic Places.

Since a major portion of the Colstrip alternative route transects rough and broken topography, containing no perennial water sources, a strong possibility exists that fewer prehistoric and historic sites would be along this alternative than along the other routes. The existing data regarding white settlement patterns in eastern Montana suggest a preference for the well-watered valleys along perennial streams.

The direct impacts to sites beyond the right-of-way, but within the 3,000-foot corridor, resulting from the construction of the Colstrip alternative route would be the same as those impacts caused by the proposed rail line (see section A12.1.1.4). Nine prehistoric sites lie within the Colstrip alternative 3,000-foot corridor (see Table A12-14). None of these sites is specific to the Colstrip route; each is located along the route of the proposed rail line. One site (24RB221) has formally been determined eligible for the National Register. Three other sites, 24PR30, 24PR568, and 24RB904 (all campsites), are probably eligible for the National Register. None of these sites are likely to be directly impacted by construction of the Colstrip alternative.

TABLE A12-14

PREHISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF CENTERLINE)
COLSTRIP ALTERNATIVE

SITE NO.	SITE TYPE	CULTURAL PERIOD	NATIONAL REGISTER STATUS
24PR30	Stone Circle	--	Probably eligible
24PR568	Campsite	--	Probably eligible
24PR1150	Campsite[b]	--	Unevaluated
24RB219	Lithic Procurement	--	Ineligible
24RB220	Campsite	--	Ineligible
24RB221	Campsite	Middle and Late Plains Archaic	Eligible
24RB222	Lithic Workshop	--	Ineligible
24RB225	Campsite	--	Ineligible
24RB904	Open campsite	Late Prehistoric	Probably eligible

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 9

[a] Exclusive of sites within the right-of-way
[b] Couldn't be relocated during 1981 field reconnaissance; site area should be tested

Thirteen historic sites are located within the total 3,000-foot corridor of the Colstrip alternative route (see Table A12-15). Four of these are specific to the Colstrip alternative route, and have been given tentative National Register eligibility recommendations. Sites 24RB898 and TRR-114, both extensive homestead sites, are probably eligible for nomination to the National Register. Neither site has an existing buffer to shield it from impacts. Site TRR-43, an occupied ranch, and 24RB899, an abandoned frame ranch house, are probably ineligible for the National Register. The remaining sites all occur along the route of the proposed rail line. Three of these, TRR-110

(the Willow Crossing School), TRR-201 and TRR-202 are probably eligible for the National Register. The Willow Crossing School has no existing topographic or vegetative buffer that would protect it from visual or audible impacts. Sites TRR-201 and TRR-202 would be buffered from visual or audible impacts by a topographic buffer.

TABLE A12-15

HISTORIC SITES LOCATED WITHIN 3,000-FOOT CORRIDOR[a]
(1,500 FEET EITHER SIDE OF CENTERLINE)
COLSTRIP ALTERNATIVE

SITE NO.	SITE TYPE	NATIONAL REGISTER STATUS
TRR-43	Occupied Ranch with log outbuildings	Probably ineligible
24PR273	Vacant Ranch Complex (house burned down)	Probably ineligible
TRR-56	Occupied Ranch Complex (one sandstone structure)	Probably ineligible
24RB166	Vacant Ranch Complex	Ineligible
24RB171	North-South Railroad Grade	Ineligible
24RB898	Extensive vacant log homestead complex	Probably eligible (no existing buffer)
24RB899	Abandoned frame ranch house and corral	Probably ineligible
TRR-109	Abandoned homestead complex with occupied trailer	Probably ineligible
TRR-110	Willow Crossing School	Probably eligible (no existing buffer)
TRR-111	Foundations only	Probably ineligible
TRR-114	Occupied ranch	Probably eligible (no existing buffer)
TRR-201	Martin Two Bulls' House	Probably eligible (Buffered by topography)
TRR-202	Julia Fire Crow's Residence	Probably eligible (Buffered by topography)

TOTAL NUMBER OF SITES WITHIN 3,000-FOOT CORRIDOR = 13

[a] Exclusive of sites within the right-of-way

Indirect Impacts

The indirect impacts associated with the construction of the Colstrip alternative would be the same as those impacts discussed for the proposed rail line (see section A12.1.1.4). National Register eligible sites located within the Colstrip alternative 3,000-foot corridor may be impacted by the construction of this alternative.

A12.4.1.2 Mitigative Measures

The mitigative measures for those adverse impacts caused by the construction of the Colstrip alternative route would be the same as those measures discussed for the proposed rail line (see section 12.1.1.4).

A12.4.2 Operation and Maintenance

As discussed in section A12.1.2, the operation and maintenance of the proposed railroad most likely would impact those historic sites which contain standing structures. Thirteen such sites are located within the 3000-foot study corridor of the Colstrip alternative route. Applying the predictive percentage of National Register eligible sites to this number indicates that approximately 3 of the 13 sites would be eligible for the National Register. Five of the 13 sites already located are probably eligible for the National Register (24RB898, TRR-110, TRR-114, TRR-201, and TRR-202).

The possible impacts to these three predicted National Register eligible sites would depend upon the same factors that are discussed for the proposed rail line (see section A12.1.2). The possible impacts to these sites similarly would be functions of their location and of the presence of vegetative and topographic buffers.

A12.4.2.1 Mitigative Measures

The mitigative measures for those adverse impacts to cultural resources resulting from the operation and the maintenance of a railroad along the Colstrip alternative route would be the same as those measures for the proposed rail line (see section A12.1.2).

A12.4.3 Related Actions

The impacts to cultural resources and the mitigative measures for the related actions associated with the Colstrip alternative route are the same as those impacts and measures for the proposed rail line (see section A12.1.3).

A12.5 FOOTNOTES

1. See the National Historic Preservation Act of 1966 (Public Law 89-665), 16 USC 470-470(m), for reference to the National Register of Historic Places, and 36 CFR Part 60 for the criteria established to determine eligibility or ineligibility for the National Register.

2. Carl M. Davis, "Preliminary Archaeological Reconnaissance Survey, Bureau of Land Management Lands, Southeastern Montana" (unpublished, 1976); Thomas R. Lincoln, "Tongue River Archaeological Survey, Sheridan County, Wyoming" (unpublished, 1977); Michael L. Gregg, Archaeological Values on Kiewit-Whitney, Sheridan County, Wyoming, Montana Tech Alumni Foundation, Cultural Resources Division, Reports of Investigations No. 7 (Butte: Mineral Research Center, 1978); Bonnie Hogan, Cultural Resources Inventory and Assessment: Big Horn-Jensik Hill, Sheridan, Wyoming, Montana Tech Alumni Foundation, Cultural Resources Division, Reports of Investigations No. 11 (Butte: Mineral Research Center, 1979); Gene Munson and Shirley Munson, Big Sky Mine, Peabody Coal Area: A Cultural Resources Investigation and Assessment, Montana Tech Alumni Foundation, Cultural Resources Division, Reports of Investigations No. 12 (Butte: Mineral Research Center, 1980); Sherri Deaver, "Site Distribution in the Hanging Woman and Moorhead Areas" (unpublished, 1981); Lynn B. Fredlund and Dale E. Fredlund, Appendix L: Archaeology, Montco Mine Permit Application, Vol. 21 (Billings: Montco, Inc., 1980, unpublished); Michael L. Gregg, Archaeological Survey at CX Decker (1976-1977), Montana Tech Alumni Foundation, Cultural Resources Division, Reports of Investigations No. 3 (Butte: Mineral Research Center, 1977); Sally T. Greiser and Alan S. Newell, "CX Ranch Project Cultural Resource Inventory, Decker, Montana," prepared for Consolidation Coal Company, Sheridan, Wyoming, by Historical Research Associates, Missoula, Montana, 1981.

3. Ibid.

4. Historical Research Associates, Missoula, Montana, conducted historic resource inventories for the following documents: Montana Department of State Lands, "Draft Environmental Impact Statement, Montco Mine, Rosebud County, Montana," Helena, Montana, May 1982; "CX Ranch Project Cultural Resource Inventory, Decker, Montana," prepared for Consolidation Coal Company (Sally T. Greiser and Alan S. Newell, editors), September 1981.

5. The ICC has initiated formal consultation with the President's Advisory Council on Historic Preservation and the Montana State Historic Preservation Office.

6. Legislation mandating the consideration of the cultural resource includes the National Historic Preservation Act; the National Environmental Policy Act; Executive Order 11593; the Act for the Preservation of American Antiquities of 1906, as amended; the Reservoir Salvage Act of 1960, as amended; and the Montana State Antiquities Act of 1973.

A13.0 AESTHETIC RESOURCES

A13.1 PROPOSED ACTION

The construction and the operation of the proposed railroad would introduce a visual intrusion into portions of the study area. The degree of this visual impact would depend upon the extent to which the route of the railroad would contrast with the project area landscape and would be visible to the public. The following section assesses potential visual/aesthetic impacts associated with the proposed Tongue River Railroad Company rail line. In addition, visual impacts to cultural resource sites are discussed in the section (A12.0) on cultural resources. A method of objectively quantifying aesthetic impacts was employed in this analysis. Nevertheless, the extent of a visual impact is as much a subjective evaluation by the viewer as it is an objective assessment by the analyst. In order to present a "worst case" analysis of impacts, the high scenario of TRRC train traffic was considered in the aesthetic evaluation.

A13.1.1 Construction

A13.1.1.1 Methods

The analysis of those potential visual impacts generated by the construction of the proposed rail line principally involved two tasks: an inventory, and an impact assessment. Criteria established by the U.S. Forest Service Visual Management System (VMS) and by the U.S. Bureau of Land Management Visual Resource Management (VRM) were used to inventory the scenic qualities of the project area. Both of these systems establish landscape character types and subtypes for the southeast Montana region.[1]

The project area is located within the Rocky Mountain Foreland Subregion, a landscape character type of the Great Plains Physiographic Province. Based on ground and aerial reconnaissance, the project area was divided into seven landscape character subtypes: (1) the Tongue River and Creek flood plains; (2) the Yellowstone River flood plains; (3) the shrub/grassland prairie; (4) the ponderosa pine/upland slopes and mesas; (5) the developed rural community; (6) the developed urban area; (7) the developed heavy-industrial/urban area.

The degrees of visual diversity between subtypes are termed "variety classes" in the VMS system and "scenic quality rating units" in the VRM system. For the current analysis, the U.S. Forest Service's VMS system was used to evaluate scenic quality. Three variety classes were considered: Class A--distinctive landscapes; Class B--landscape of common visual characteristics; Class C--landscape of minimal visual diversity.[2]

The scenic quality of the project area landscapes were determined through: (1) a review of the Bureau of Land Mangement and Forest

Service ratings for lands within the region; (2) the subsequent application of the Forest Service's VMS system and criteria to lands within the study area; and (3) aerial and ground reconnaissance.[3] The study area was determined to contain no Class A landscapes, three Class B subtypes, and four Class C subtypes.

In addition, interviews with federal, state, and local individuals, and both aerial reconnaissance and ground reconnaissance were used to identify sensitive use areas (SUA). Sensitive use areas are defined as places where the visibility of the proposed rail line may be perceived as a visual intrusion. Approximately 35 SUAs were identified within 2 miles of the proposed rail line and of the alternative routes. These SUAs include existing and planned residential areas, parks and recreational areas, highways and roads, and sites either listed on, or eligible for listing on, the National Register of Historic Places. SUAs also were located on 7.5-minute U.S. Geological Survey quadrangle maps of the project area.

The inventory phase of the visual impact analysis was followed by an impact assessment that evaluated the visual contrast of the proposed rail line in relationship to the landscape. Visual contrast ratings for the rail line were developed based upon the premise that the contrast between the proposed rail line and the existing landscape character subtype or the SUA can be measured by predicting the magnitude of change that each component of the rail line project would exert on the subtype or on the SUA. This assessment involves the prediction of changes in such existing visual elements as line, form, color, and texture.

The following six project components were used in the analysis of visual impact:

(1) Railroad and Transmission Line. Through most of the study area landscapes, the railroad and the transmission line would create slight contrasts to existing visual elements, because of their compatible scale and weak line characteristics.

(2) Sidings. The distinguishing visual characteristic of sidings is the increased presence of trains that they cause at various siding locations. Table A13-1 presents the data used to assess the possible visual impacts generated by trains queuing at sidings.

(3) Trains. Because of their distinct color and solid form, trains generally would create strong contrasts with non-developed landscape-character subtypes. The degree of their visual impact would be a function of the number of trains per day (see Table A13-2).

(4) Bridges. The degree of visual contrast potentially created by bridges varies with the landscape character subtype. Most bridges for the proposed rail line would run 140 to 190

TABLE A13-1

VISUAL CONTRAST RATING--LANDSCAPE CHARACTER SUBTYPE[a]
PROPOSED ACTION

LANDSCAPE CHARACTER SUBTYPE	VISUAL CONTRAST RATINGS								
	PROJECT FACILITIES				CUTS (feet)			FILLS	
	RAILROAD TRANSMISSION LINE	PRESENCE & MOVEMENT OF TRAINS	SIDINGS	BRIDGES	SMALL 0-25/30	MEDIUM 30-65/70	LARGE >70	MEDIUM	LARGE
Tongue River and Creek flood plains	Very low	Moderate	Very low	Low	--	--	--	Very low	Moderate
Yellowstone River flood plain	Very low	Low	Very low	Moderate	--	--	--	Very Low	Moderate
Shrub/grassland prairie	Low	Moderate	Low	Low	Very low	Low	Moderate	Low	Low
Ponderosa pine/ upland slopes and mesas	Low	Moderate	Low	Moderate	Very low Moderate	Low Moderate	Moderate High	Low	Low
Developed rural community	Very low	Moderate	Very low	Low	--	--	--	Very low	Very low
Developed urban	Very low	Low	Very low	Very low	--	--	--	Very low	Very low
Developed heavy-industrial/urban	Very low	Very low	Very low	Very low	--	--	--	Very low	Very low

[a] Higher contrast ratings apply to cuts through treed/forested areas

TABLE A13-2

ESCALATION OF TRAIN MOVEMENT AND DELAY PERIODS, 1983-2011
PROPOSED ACTION

TRAIN ACTIVITY	1986/87	1991	1996	2001	2006	2011
Total Number of Trains Per Day (High Scenario)	1	5	10	19	25	25
Average Hourly Interval between Trains	24.0	4.8	2.4	1.2	57min.	57min.
DELAY TIME IN SIDINGS (in hours)						
Average Delay Time Per Train	--	.4	.6	1.1	1.2	1.4
Average Total Delay Time Per Day (24-hr. period)	--	2.8	6.0	20.9	30.0	35.0

feet in length and would be constructed of steel, concrete, and asphalt materials.

(5) Cuts. Cuts along the proposed rail line were defined by size: small cuts--up to 25-30 feet in vertical height; medium cuts--30-70 feet in vertical height; large cuts--over 70 feet in vertical height. This analysis assumes that cut slopes would be revegetated.

(6) Fills. The degree of visual contrast created by fills primarily would depend upon the direction or the angle of the fill in relation to the natural terrain. Fills aligned parallel to natural terrain lines generally would create weak contrasts with the existing landscape and are classified as small/medium fills. Fills aligned in directions perpendicular to, or against, natural terrain lines would result in significantly greater contrasts. An example of this type of situation is a fill constructed across a flood plain, where the natural boundaries and lines of the valley are sharply broken. Fills aligned in directions contrasting with the landscape features are classified as large fills.

The visual contrast ratings assigned to each of the proposed rail line's components and to the landscape character subtypes are shown in Table A13-1. Four levels of visual contrast were determined for this study: (1) very low; (2) low; (3) moderate; (4) high. The definitions of these levels are:

(1) Very low. The rail line component would create visual characteristics similar to those characteristics that currently exist in the landscape character subtypes.

(2) Low. The rail line component would introduce additional visual characteristics into the landscape that would be evident but would not necessarily attract attention.

(3) Moderate. The rail line component would introduce visual characteristics that noticeably would be different in character from the existing visual elements.

(4) High. The rail line component visually would dominate the landscape and would cause a severe degree of change in the visual character of the landscape character subtype.

Visual contrast ratings also were determined for SUAs. Four rail line component variables and three SUA variables were employed in the analysis (see Table A13-3).

The rail line component variables include:

(1) Distance.
Foreground: .25-.50 miles from the SUA
Middleground: .50-1.5 miles from the SUA
Background: more than 1.5 miles from the SUA

(2) Size and Scale. Visual dominance of cuts and fills.

(3) Angle of View. The angle or direction in which the railroad and trains would be viewed from the SUA.

(4) Duration and/or Frequency of View. On-going visual impacts to a SUA for the life of the project--e.g., visibility to trains as intermittent and increasing over time.

The three SUA variables are:

(1) Visibility Conditions.
Open: allowing panoramic or extended views
Enclosed: views restricted to the immediate foreground or middleground
Focal: dominant features that command visual attention

(2) Duration of View. Residential areas--extended period of view
Parks and recreation areas--less extensive period of view
Transportation corridors--lowest duration of view.

(3) Existing Cultural Modification. Degree to which existing views from SUAs include cultural modifications, such as heavy-industrial features.

TABLE A13-3

VISUAL CONTRAST RATINGS--SENSITIVE USE AREAS: PROPOSED ACTION

PROPOSED ACTION / SENSITIVE USE AREA (SUA)	EXISTING SUA VIEWSHED CHARACTERISTICS: LANDSCAPE CHARACTER SUBTYPE[a]	VISIBILITY	VIEW ORIENTATION/CULTURAL MODIFICATIONS	POTENTIAL PROJECT VISIBILITY CHARACTERISTICS: DISTANCE	PROJECT COMPONENTS[b] RR/TR	T	B	B	C	F	VISUAL CONTRAST 1986/87 to 1996	VISUAL CONTRAST 1996 to 2011
PARK AND RECREATION AREA												
Branum Lake Recreation Area	6	open & enclosed	Visibility variable; picnic area confined visibility, lake open visibility; adjacent to BN railroad to northwest; lake merrsely dry	Foreground; crosses through northeast part of recreation area	x	x		x			low	moderate
Twelve Mile Dam Fishing Access Site	1	enclosed	Visibility confined by vegetation and river channel; Tongue River Road Bridge and adjacent farming activities visible	Middleground; .4 miles west		x					very low	low
Spotted Eagle Recreation Area	6	enclosed	Views to the north, west, and south restricted by vegetation; views to the west and southwest partially open in vicinity of riding and nature trails	Foreground; adjacent and southwest of recreation area		x					low	moderate
Eastern Montana Fairgrounds	6	open	Open visibility; view orientation primarily to the east; BN railroad adjacent and south of fairground	Foreground/Middleground; .3 miles southwest		x		x			very low	low
Designated Open Space	6	open	Undeveloped, open field; adjacent to BN railroad to southeast	Foreground; crosses southwest edge of property	x	x		x			low	moderate
Art Center and Campground	6	enclosed	Visibility to the south and southwest limited by MR railroad fill; site adjacent to MR railroad	Foreground; .1 mile southwest		x					very low	low
Golf Course	6	enclosed	Views almost entirely confined by buildings and vegetation	Middleground; .7 miles west and southwest		x					very low	very low
Potential Tongue River Recreation Area	1	open & enclosed	Visibility partially confined by vegetation	Background; 1.7 miles west;		x					very low	very low
TRANSPORTATION												
U.S. 94	6	open	Visibility to BN railroad, Miles City, agriculture and livestock area	Foreground; highway will cross over railroad by highway bridge; visible for 1.0 miles	x	x		x			very low	very low
U.S. 10	6	open	Visibility to BN railroad, cultural sites, agriculture livestock area	Foreground; road will cross over railroad by highway bridge; visible for 1.0 miles	x	x		x			low	low
State Highway 312	3	open	Viewshed orientation--Tongue River and agricultural area	Background--1.2 miles west; variable visibility for 4.5 miles of highway				x			very low	very low
State Highway 212	1,4,5	open & enclosed	Viewshed orientation--Otter Creek; current setting predominantly natural with agriculture	Foreground; railroad will cross over highway except along Otter Creek Line, where it will cross under highway; railroad visible for .8 miles except along Otter Creek Line, where railroad visible for 1.0 miles	x	x		x	x	x	moderate (low Otter Creek)	moderate
State Highway 212 assuming Ashland NW Alignment	5	open & enclosed	Visibility in Ashland enclosed by structures and vegetation; views to residential, commercial, and industrial land uses	Foreground; highway will cross over railroad; railroad visible for about 1.0 miles	x	x					very low	low
FAS 566 (south of Ashland)	1,4	open	Viewshed orientation--Tongue River; current setting predominantly natural, with agriculture	Foreground; railroad will parallel road for 5.5 miles	x	x		x	x		moderate	moderate
FAS 566 (remainder)	4	open	Viewshed orientation--plateau; current setting predominantly natural	Foreground; railroad will cross road and parallel for 1.5 miles; railroad visible for 2.5 miles	x	x			x		moderate	moderate
FAS 566 assuming Ashland NW Alignment	4	open	Viewshed orientation--Tongue River; current setting predominantly natural, with agriculture	Foreground; railroad will cross road; railroad visible for 1.0 miles	x	x					very low	moderate
FAS 477	1,4	open	Viewshed orientation--Tongue River and steep ridges; current setting predominantly natural, with agriculture	Middleground/Background; 1.0 plus miles east for approximately 7.5 miles		x	x		x		very low	low
FAS 332 (Tongue River Road)	1,3,4	open	Viewshed orientation--Tongue River and steep ridges; current setting mixture of natural landscape and agricultural characteristics	Foreground; parallels 8.0 miles; Background--1.0 to 2.0 miles west of road for 27 miles; variable visibility	x	x	x	x	x		low	moderate
King Creek Road	4	open	Visibility along road confined by surrounding ridges to the north and south; natural setting; limited views to Tongue River at west end of road	Foreground; railroad and road intersect; railroad visible for approximately .5 miles	x	x			x		low	moderate
RESIDENTIAL - EXISTING												
Miles City	6	enclosed	Views almost entirely enclosed by structures and vegetation; two existing railroads--BN and CM	Middleground; 5 miles southwest; potential visibility very limited		x					very low	low
Ashland	5	open & enclosed	Variable visibility; views to southeast and east significantly limited by vegetation	Middleground; .5 miles east of Mission area and .5 miles southeast of Ashland center		x		x			very low	low
Ashland assuming Ashland NW Alignment	5	open & enclosed	Variable visibility; existing roads, residential, industrial, and commercial uses predominate visual character	Foreground; crosses through Ashland; Middleground; about .5 miles east of Mission	x	x		x		x	moderate	high
RESIDENTIAL - PLANNED												
Ashland (Travel Subdivision)	5	open	About 5 houses--subdivision; elevated with panoramic views	Foreground; crosses through area	x	x	x				moderate	high
Ashland assuming NW Alignment (Travel Subdivision)	5	open	About 5 houses--subdivision; elevated with panoramic views	Foreground; crosses through area	x	x	x	x	x	x	moderate	high
Ashland assuming NW Alignment (Snodgrass Subdivision)	5	open & enclosed	Variable visibility; views to north and northwest limited by topography, structures	Foreground/Middleground; .3 to 1 mile northwest of planned residential area	x	x		x		x	low	low
Custer County Subdivision (Tongue River Estates)	1	open	Site currently agricultural use; about 4 houses located south; views oriented to the west towards Tongue River; visibility west of river limited by vegetation	Background; 1.0 miles west		x					very low	low
Powder River County (Trussler Subdivision)	1,4	open & enclosed	Visibility variable due to topography and vegetation; subdivision undeveloped; current setting natural and agricultural	Foreground; crosses southern edge of subdivision	x	x		x			low	moderate

[a] Landscape Character Subtypes:
(1) Tongue River and Creek flood plains
(2) Yellowstone River flood plains
(3) shrub/grassland prairie
(4) ponderosa pine/upland slopes and mesas
(5) developed rural community
(6) developed urban area
(7) developed heavy-industrial/urban area

[b] Project Components:
RR/TR = Railroad and Transmission
T = Trains
S = Sidings
B = Bridges
C = Cuts
F = Fills

A13.1.1.2 Impacts

The construction of the proposed rail line would produce short term and long term visual impacts to SUAs and on the scenic quality of the landscape. The visual impacts associated with the presence of the crews, the machinery, and the construction materials would be short term, existing only during the construction phase of the project. Included among the short term impacts are those visual/aesthetic impacts associated with the construction camps--those 40-acre areas located outside the right-of-way and used for housing, for storing equipment, and for staging activities.

The visual impacts from the project's construction would be most evident in the vicinities of Miles City, of Ashland, and of the major transportation corridors. The construction of overpasses for U.S. 94 and for U.S. 10, near Miles City, which would require a 30-35 foot fill, would be visible to residents of that community. The construction of the railroad bridges over U.S. 212 and over Otter Creek, near Ashland, would result in short term visual impacts to local residents. With the Ashland SE Alignment, an extensive rail line cut, near Ashland, also would exert visual impacts lasting approximately ,0 months, a longer period than that associated with other cut and fill activities. The Ashland NW Alignment, however, would avoid this severe cut and the modification in landform and vegetation that would create very strong visual contrasts.

Long term visual alterations to the landscape and SUAs may result from several construction activities: (1) right-of-way clearing and grubbing; (2) right-of-way fencing; (3) topsoil stripping and stockpiling; (4) cut-and-fill work; (5) the construction of major structures, bridges, and crossovers; (6) the construction of drainage structures, culverts, ancillary buildings, and the railroad and transmission line. The long-term visual impacts created by construction activities are discussed in section A13.1.2.

A13.1.2 Operation and Maintenance

A13.1.2.1 Impacts to the Landscape's Scenic Quality

The operation of the proposed railroad would produce high impacts to the landscape's scenic quality along 1.8 miles of the 89-mile route. High impacts result when landforms are severly modified, such as the large cut near Ashland would cause. Because that cut would disturb about 1,500 feet of ponderosa pine stands, its modifications to the landform and to the vegetation would create strong visual contrasts with the surrounding environment, in terms of form, color, and texture.

Moderate impacts would occur along 5.1 miles of the proposed railroad. These impacts would include: (1) cuts more than 65 feet high, which would create man-made forms in the landscape that contrast with the natural terrain; (2) fills aligned perpendicular to, and across,

natural flood plain lines, which would modify landforms and often obstruct views to rivers and creeks; (3) the removal of ponderosa pine or deciduous tree stands. Four cuts more than 65 feet high occur along the route of the proposed rail line; they would precipitate a total of 1.5 miles of moderate impacts.[4]

Moderate scenic impacts that are associated with fills across flood plains would occur along the proposed route at three bridge-crossing locations--one over the Tongue River and two over Otter Creek. These three flood plain fills would produce a total of approximately 2 miles of moderate scenic impacts. In addition, the large fill at Miles City would cause a moderate scenic impact to that community. At four locations along the proposed railroad's route, ponderosa pine stands would be removed, thus creating strong contrasts with the natural terrain's line, color, and form. These stands are crossed for a total of 1.6 miles.

Low impacts would occur along 33.2 miles of the proposed route. In this case, the proposed route would create visually evident, but minor, changes in the landscape. Low impacts generally were identified in predominantly natural portions of the shrub/grassland prairie landscape character subtype and of the ponderosa pine/upland slopes and mesas subtype. In these areas, the railroad, transmission line, bridges, and culverts would create only weak visual contrasts in line, color, and form with the existing natural environment. Cuts of medium size--e.g., cuts 25 to 65 feet high--would occur in 27 locations, to cause low impacts for a total of 4.2 miles. Smaller cuts, ranging from 1 to 25 feet high, would occur as well.

These cuts and fills would produce visually evident, man-made patterns in the landscape. The degree of visual contrast that the cuts would create with the existing landscape depends upon the size of the cut and on the extent to which the cut slopes are revegetated. The low impact rating for cuts and fills is based upon the assumption that TRRC revegetation and maintenance programs would be sufficient to reestablish a vegetative cover similar to the one that currently exists on the natural terrain. Assuming sufficient revegetation, the proposed railroad would create only a low, or a weak, visual contrast with the existing environment.

Very low impacts would occur for 48.2 miles of the proposed route, in areas where the natural landscape already has been modified in ways similar to the ways that would be caused by the railroad--e.g., the presence of roads, rail lines, transmission lines, utility lines, and agricultural developments. The degree of potential visual change created by the introduction of the rail line and the transmission line is considered minimal in communities such as Miles City, Ashland, Colstrip, in parts of the Tongue River Valley and the Otter Creek Valley where intensive agricultural operations are present, and in selected parts of two landscape character subtypes--shrub/grassland prairie and ponderosa pine/upland slopes and mesas--where the proposed railroad would parallel existing roads at the edge of the Tongue River flood

plain. Although the presence and movement of trains would create greater visual contrasts in the landscape, these impacts would occur on a temporary, intermittent basis.

Visual impacts for the Tongue River Road on the scenic quality of the landscape would be lower along the Ashland NW Alignment because of its avoidance of the large cut along the route of the proposed rail line. Elsewhere, the optional route would result in comparable impacts on the scenic quality of the landscape as the proposed railroad.

A13.1.2.2 Impacts to Sensitive Use Areas

The route of the proposed railroad would be located within the view of those 22 sensitive use areas shown in Table A13-3. Between 1987 and 1996, the proposed railroad should not exert high impacts on any sensitive use areas. During this production phase, it may generate moderate impacts on 4 SUAs, low impacts on 7 SUAs, and very low impacts on the remaining 11 SUAs. Between 1996 and 2011, visual impacts to SUAs would increase as a result of the additional train activity. One sensitive use area potentially would incur high visual impacts. During the same period, nine SUAs would experience moderate visual impacts, eight SUAs would receive low visual impacts, and four SUAs would sustain very low visual impacts.

The Ashland NW Alignment would have significantly greater visual impacts on Ashland than the Ashland SE Alignment. Since the NW route is located in a central part of the community, train traffic would be frequently visible to the residents. However, visual impacts on State Highway 212 would be lower along the NW route. The Tongue River Railroad would pass under the state highway and, thus, would be considerably less visible from the highway than the proposed overpass. Both the Ashland alignments would have similar moderate to high impacts on the Tranel Subdivision (see Table A13-3).

A13.1.2.3 Mitigative Measures

The impacts to the landscape's scenic quality could be minimized with the preparation and the implementation of a detailed revegetation and erosion control plan. Revegetation and vegetation maintenance programs would reduce the visual contrasts of cuts by revegetating slopes to a degree comparable to their original, natural conditions.

The potential visual impacts to sensitive use areas in most instances could be significantly reduced or eliminated along the route of the proposed railroad. Visual impacts to such residential developments as the Tranel and Trusler Subdivisions could be mitigated by two means: (1) establishing buffers in locations where the railroad would be highly visible to residences; (2) locating sidings beyond the view of the SUA. The visual impacts to the Trusler Subdivision also could be reduced by coordinating efforts with landowners to establish

the buffers. The visual impacts to the Spotted Eagle Recreation Area could be alleviated by establishing a tree buffer between the railroad and the park area.

A13.1.3 Related Actions

Activities related to the Tongue River Railroad include five potential mine sites that would be served by the railroad and the growth of urban areas that would result from the employment associated with the mines and with the railroad.[5]

A13.1.3.1 Impacts to the Landscape's Scenic Quality

The cumulative coal-mining impacts associated with the related actions would change specific landscapes within the study area. During the mining period, the mine permit area would assume an industrial character, rather than retain its agricultural character. Since the five mine sites are located predominantly in the ponderosa pine/upland slopes and mesas landscape character subtype, the landscapes most likely affected by the mines include the subtypes in three locations: (1) west of the Tongue River and south of Ashland; (2) on either side of Otter Creek; (3) south of Rosebud Creek and west of Rosebud County Road FAS 447. Following reclamation, these landscapes likely would resemble the shrub/grassland prairie landscape character subtype. A degree of visual diversity permanently would be lost from the ponderosa pine/upland slopes and mesas subtype when rock croppings and highly colored rock shales are removed by mining.

A13.1.3.2 Impacts to Sensitive Use Areas

The sensitive use areas that may be affected by the related actions are several: (1) Ashland; (2) Custer National Forest, specifically the King Mountain Riding and Hiking Area; (3) the Trusler Subdivision; (4) Montana State Highway 212; (5) Rosebud County Road FAS 566; (6) Rosebud County Road FAS 447; (7) King Creek Road. The potential aesthetic and visual impacts to Ashland and to its planned residential areas are associated with population growth. The changes in the visual character of Ashland would result from such elements as increased traffic and housing developments. Travelers on local roads would experience an increased visible exposure to traffic, dust, and mining operations.

Since the King Creek Road is located within the Montco mining site, the SUA would be impacted. The aesthetic and visual effects to the Custer National Forest may be significant, because four of the mine sites are adjacent to the National Forest. The Montco mining site also is adjacent to, and west of, the King Mountain Riding and Recreation Area.

A13.2 TONGUE RIVER ROAD ALTERNATIVE

A13.2.1 Construction

The methods applied to calculate the visual impacts along the alternative route along the Tongue River Road are the same as those methods used for the proposed rail line. The visual impacts generated by the construction of the alternative route would be essentially the same as those impacts described for the proposed rail line. However, additional visual impacts may occur along the Tongue River Road (FAS 332).

A13.2.2 Operation and Maintenance

A13.2.2.1 Impacts to the Landscape's Scenic Quality

The Tongue River Road alternative route would cause high visual impacts to the landscape's scenic quality along 1.8 miles of its route. Moderate impacts would be produced for 8.1 miles, low impacts for 15.5 miles, and very low impacts for 61.3 miles along the route. The high impacts for this alternative would occur at the same location as would the high impacts associated with the proposed railroad. The moderate impacts along the Tongue River Road alternative would involve the following operations:

(1) Five large cuts, which total approximately 2 miles of impact.

(2) Fills across three floodplains, which total 3.5 miles of impact.

(3) The removal of ponderosa pine stands at three locations and the disturbance of deciduous tree stands at seven locations, which total 2.6 miles of impact.

One cut for the Tongue River Road alternative route would be located in the shrub/grassland prairie landscape character subtype, and four cuts would be situated in the ponderosa pine/upland slopes and mesas subtype. Two of the fills would cross the Otter Creek flood plain in the same areas as would the proposed railroad. The other fill would cross the Tongue River flood plain and extend for almost 2 miles--considerably longer than the fill required for the proposed railroad. This alternative route would include the fill at Miles City. Low and very low impacts would occur to the landscape's scenic quality for 15.5 miles and 61.3 miles, respectively, along the Tongue River Road, in landscape conditions similar to those conditions described for the proposed railroad. The Tongue River Road has created significant landform modification along major portions of the road. Since the alternative would parallel the road for 38 miles, very low impacts on the landscape's scenic quality should occur along the major portion of the alternative route.

A13.2.2.2 Impacts to Sensitive Use Areas

The Tongue River Road alternative route would be located within the view of those 22 sensitive use areas presented in Table A13-4. Between 1987 and 1996, the alternative route would produce no high visual impacts to SUAs. It simultaneously may generate moderate impacts to five SUAs, low impacts to eight SUAs, and very low impacts to nine SUAs. After 1996, the increased train activity would cause high visual impacts to three SUAs, moderate impacts on eight SUAs, low impacts on seven SUAs, and very low impacts on four SUAs.

Railroad operation along the Tongue River Road alternative route would result in moderate-to-high visual impacts on the Tongue River Road Estates Subdivision. Train activity would occur within the foreground views of subdivision residents and would create strong visual contrasts to the existing SUA views. The railroad fill and bridge across the Tongue River and across its flood plain on this route probably would be visible from portions of the subdivision.

The Tongue River Road alternative route would pass adjacent to the Twelve Mile Dam Fishing Access Site, which currently includes views enclosed, in most directions, by the dense river bottom vegetation. Between 1987 and 1996, the alternative most likely would result in only low visual contrasts for viewers from the recreation site because of the infrequent passage of trains. As train activity increases and additional facilities are constructed at the dam, the visual impacts to the site may increase to a high level.

Paralleling the Tongue River Road for approximately 38 miles, the Tongue River Road alternative route would produce low visual contrasts with current roadside views, because of the presence of the train, the transmission line, and the associated cuts and fills. The addition of train activity would create moderate visual contrasts and would result in predominantly moderate levels of impact from 1996 to 2011.

A13.2.2.3 Mitigative Measures

Besides the mitigation recommendations outlined for the proposed railroad, the following measures can be applied to the Tongue River Road alternative route:

(1) Relocating the right-of-way east of the Tongue River Road Estates and establishing tree buffers where necessary to reduce the visibility of the project.

(2) Relocating the right-of-way further east of the Twelve Mile Dam Fishing Access Site and coordinating efforts with the Montana Department of Fish, Wildlife and Parks to situate the rail line so the project would not conflict significantly with views from the site's planned campground.

TABLE A13-4

VISUAL CONTRAST RATINGS--SENSITIVE USE AREAS: TONGUE RIVER ROAD ALTERNATIVE

TONGUE RIVER ROAD ALTERNATIVE SENSITIVE USE AREA (SUA)	EXISTING SUA VIEWSHED CHARACTERISTICS LANDSCAPE CHARACTER SUBTYPE[a]	VISIBILITY	VIEW ORIENTATION/CULTURAL MODIFICATIONS	POTENTIAL PROJECT VISIBILITY CHARACTERISTICS DISTANCE	PROJECT COMPONENTS[b] RR/TR	T	S	B	C	F	VISUAL CONTRAST 1986/87 to 1996	1996 to 2011
PARK AND RECREATION AREA												
Granum Lake Recreation Area	6	open & enclosed	Visibility variable; picnic area confined visibility, lake open visibility; adjacent to BN railroad to northwest; lake currently dry	Foreground; crosses thru northeast part of recreation area	x	x		x			low	moderate
Twelve Mile Dam Fishing Access Site	1	enclosed	Visibility confined by vegetation and river channel; Tongue River Road Bridge and adjacent farming activities visible	Middleground; .4 miles west		x		x		x	low	high
Spotted Eagle Recreation Area	6	enclosed	Views to the north, east, and south restricted by vegetation; views to the west and southwest partially open in vicinity of riding and nature trails	Foreground; adjacent and southwest of recreation area		x					low	moderate
Eastern Montana Fairgrounds	6	open	Open visibility; view orientation primarily to the east; BN railroad adjacent and south of fairground	Foreground/Middleground; .3 miles southwest		x		x			very low	low
Designated Open Space	6	open	Undeveloped, open field; adjacent to BN railroad to southeast	Foreground; crosses southwest edge of property	x	x		x			low	moderate
Art Center and Campground	8	enclosed	Visibility to the south and southwest limited by MR railroad fill; site adjacent to MR railroad	Foreground; .1 mile southwest		x					very low	low
Golf Course	6	enclosed	Views almost entirely confined by buildings and vegetation	Middleground; .7 miles west and southwest		x					very low	very low
Potential Tongue River Recreation Area	1	open & enclosed	Visibility partially confined by vegetation	Background; 1.7 miles west		x					very low	very low
TRANSPORTATION												
U.S. 94	8	open	Visibility to BN railroad, Miles City, agriculture and livestock area	Foreground; highway will cross over railroad by highway bridge; visible for 1.0 miles	x	x		x			very low	very low
U.S. 10	6	open	Visibility to BN railroad, cultural sites, agricultura livestock area	Foreground; road will cross over railroad by highway bridge; visible for 1.8 miles	x	x		x			low	low
State Highway 312	3	open	Viewshed orientation--Tongue River and agricultural area	Background--1.2 miles west; Variable visibility for 4.5 miles of highway		x					very low	very low
State Highway 212	1,4,5	open & enclosed	Viewshed orientation--Otter Creek; current setting predominantly natural with agriculture	Foreground; railroad will cross over highway; railroad visible for .8 mile except along Otter Creek, where railroad visible for 1.8 mile	x	x		x	x	x	moderate (low Otter Creek)	moderate
State Highway 212 assuming Ashland NW Alignment	5	open & enclosed	Visibility in Ashland enclosed by structures and vegetation; views to residential, commercial, and industrial land uses	Foreground; highway will cross over railroad; railroad visible for about 1.0 mile	x	x					very low	low
FAS 566 (south of Ashland)	1,4	open	Viewshed orientation--Tongue River; current setting predominently natural with agriculture	Foreground; railroad will parallel road for 5.5 miles	x	x		x	x		moderate	moderate
FAS 566 (remainder)	4	open	Viewshed orientation--plateau; current setting predominantly natural	Foreground; railroad will cross road and parallel for 1.5 miles; railroad visible for 2.5 miles	x	x		x	x		moderate	moderate
FAS 566 assuming Ashland NW Alignment	4	open	Viewshed orientation--Tongue River; current setting predominantly natural with agriculture	Foreground; railroad will cross road; railroad visible for 1.0 mile	x	x					very low	moderate
FAS 477	1,4	open	Viewshed orientation--Tongue River and steep ridges; current setting predominantly natural with agriculture	Middleground; 1.0 plus miles east for approximately 7.5 miles		x	x		x		very low	low
FAS 332 (Tongue River Road)	1,3,4	open	Viewshed orientation--Tongue River and steep ridges; current setting mixture of natural landscape and agricultural characteristics	Foreground; route parallel road to west for 38 miles; Middleground/Background; .8 to 1.5 miles east for approximately 9.5 miles	x	x	x		x		low	moderate
King Creek Road	4	open	Visibility along road confined by surrounding ridges to the north and south; natural setting; limited views to Tongue River at west end of road	Foreground; railroad and road intersect; railroad visible for approximately .5 mile	x	x			x		low	moderate
RESIDENTIAL - EXISTING												
Miles City	6	enclosed	Views almost entirely enclosed by structures and vegetation; two existing railroads--BN and CM	Middleground; 5 miles southwest; potential visibility very limited		x					very low	low
Ashland	5	open & enclosed	Variable visibility; views to southeast and east significantly limited by vegetation	Middleground; .5 mile east of Mission area and .5 miles southeast of Ashland center		x		x			very low	low
Ashland assuming Ashland NW Alignment	5	open & enclosed	Variable visibility; existing roads, residential, industrial, and commercial uses predominate visual character	Foreground; crosses through Ashland; Middleground; about .5 miles east of Mission	x	x		x		x	moderate	high
RESIDENTIAL - PLANNED												
Ashland (Tranel Subdivision)	5	open	About 5 houses--subdivision; elevated with panormic views	Foreground; crosses through area	x	x	x				moderate	high
Ashland assuming NW Alignment (Tranel Subdivision)	5	open	About 5 houses--subdivision; elevated with panormic views	Foreground; crosses through area	x	x	x	x	x	x	moderate	high
Ashland assuming NW Alignment (Snodgrass Subdivision)	5	open & enclosed	Variable visibility; views to north and northwest limited by topography, structures	Foreground/Middleground; .3 to 1 mile northwest of planned residential area	x	x		x		x	low	low
Custer County Subdivision (Tongue River Estates)	1	open	Site currently agricultural use; about 4 houses located south; views oriented to the west towards Tongue River; visibility west of river limited by vegetation	Foreground; passes through adjacent subdivision area	x	x		x		x	moderate	high
Powder River County (Trussler Subdivision)	1,4	open & enclosed	Visibility variable due to topography and vegetation; subdivision undeveloped; current setting natural and agricultural	Foreground; crosses southern edge of subdivision	x	x		x			low	moderate

[a] Landscape Character Subtypes:
(1) Tongue River and Creek flood plains
(2) Yellowstone River flood plains
(3) shrub/grassland prairie
(4) ponderosa pine/upland slopes and mesas
(5) developed rural community
(6) developed urban area
(7) developed heavy-industrial/urban area

[b] Project Components:
RR/TR = Railroad and Transmission
T = Trains
S = Sidings
B = Bridges
C = Cuts
F = Fills

(3) Minimizing railroad gradings that occur at elevations higher than the road grade, to permit better roadside views to the Tongue River, the focal point of the landscape.

A13.2.3 Related Actions

The impacts from the related actions would be the same for the Tongue River Road alternative route as those discussed for the proposed railroad.

A13.3 MOON CREEK ALTERNATIVE

A13.3.1 Construction

The methods used to calculate visual impact along the Moon Creek alternative route were the same as those used for the proposed rail line. Visual impacts during construction of the alternative would be similar to those described for the proposed rail line. The Moon Creek alternative route would avoid visual impacts in the vicinity of Miles City and U.S. 10; however, additional visual impacts would occur because of the construction of a super span bridge across the Yellowstone River.

A13.3.2 Operation and Maintenance

A13.3.2.1 Impacts to Landscape Scenic Quality

The Moon Creek alternative route would cause high visual impacts to the landscape's scenic quality for 1.8 miles of the alternative route. Moderate impacts would be produced for 7.9 miles, low impacts for 30.8 miles, and very low impacts for 46.9 miles. The high impacts for the Moon Creek alternative route would occur at the same location as would the high impacts associated with the proposed railroad. The alternative would result in about 2.2 miles of moderate impact on landscape scenic quality at the crossing of the Yellowstone River, and 5.1 miles of impacts that correspond to the impacts described for the proposed railroad. This route does not include the fill at Miles City. Low and very low impacts on scenic quality would occur in similar landscape conditions as described for the proposed railroad. Along most parts of the Moon Creek alternative route located between the Yellowstone River flood plain and U.S. 94, very low impacts would occur since unpaved roads, two pipelines, and a transmission line already exist in this vicinity. Low impacts would be expected along most of the remaining miles of the Moon Creek alternative route from U.S. 94 to its junction with the proposed railroad in the Tongue River flood plain.

A13.3.2.2 Impacts on Sensitive Use Areas

The Moon Creek alternative route would be located within the view of 10 sensitive use areas, as shown in Table A13-5. The visual impacts on the following SUAs would be the same as for the proposed railroad--Ashland, the Tranel Subdivision, the Trusler Subdivision, U.S. 94, State Highway 212, FAS 566, FAS 447, and the King Creek Road. The Moon Creek alternative route would have less impact on the Tongue River Road (FAS 332) than would the proposed railroad. The alternative would parallel the road from 1 or 2 miles away for 20 miles, while the proposed railroad would parallel the road for 27 miles. During the 1987 to 1996 period, the Moon Creek alternative route would result in no high impacts, moderate impacts on three SUAs, low impacts on two SUAs, and very low impacts on five SUAs. Past 1995, high visual impacts are expected on one SUA, moderate impacts on six SUAs, low impacts on two SUAs, and very low impacts on one SUA.

A13.3.2.3 Mitigative Measures

Mitigation recommendations for the Moon Creek alternative would be the same as those described for the proposed railroad

A13.3.3 Related Actions

The impacts from the related actions would be the same for the Moon Creek alternative as those discussed for the proposed railroad.

A13.4 COLSTRIP ALTERNATIVE

A13.4.1 Construction

The methods applied to calculate the visual impacts along the Colstrip alternative route are the same as those methods used for the proposed rail line. The visual impacts produced by the construction of the alternative route would be essentially the same as those impacts described for the proposed rail line. This alternative alignment would avoid visual impacts to Miles City, to U.S. Highway 10, and to U.S. Highway 94. In turn, it would create some impacts on the community of Colstrip during the construction phase.

A13.4.2 Operation and Maintanance

A13.4.2.1 Impacts to the Landscape's Scenic Quality

The Colstrip alternative route would cause high visual impacts to the landscape's scenic quality for 1.8 miles along its route. Moderate impacts would be produced for 5.5 miles, low impacts for 21 miles, and very low impacts for 18.7 miles along this alignment. The high impacts for this alternative would occur at the same location as would

TABLE A13-5

VISUAL CONTRAST RATINGS--SENSITIVE USE AREAS: MOON CREEK ALTERNATIVE

MOON CREEK ALTERNATIVE SENSITIVE USE AREA (SUA)	EXISTING SUA VIEWSHED CHARACTERISTICS LANDSCAPE CHARACTER SUBTYPE[a]	VISIBILITY	VIEW ORIENTATION/CULTURAL MODIFICATIONS	POTENTIAL PROJECT VISIBILITY CHARACTERISTICS DISTANCE	PROJECT COMPONENTS[b] RR/TR	T	S	B	C	F	VISUAL CONTRAST 1986/87 to 1996	1996 to 2011
TRANSPORTATION												
U.S. 94	3	open	Visibility generally open--current setting--lattice tower transmission line and graded road	Foreground; highway will cross over railroad by highway bridge; visible for 1.0 miles	x	x		x			very low	very low
State Highway 212	5	open & enclosed	Viewshed orientation--Otter Creek; current setting predominantly natural with agriculture	Foreground; railroad will cross over highway; railroad visible for .8 mile except along Otter Creek, where railroad visible for 1.8 mile	x	x		x	x	x	moderate	moderate (low Otter Creek)
State Highway 212 assuming Ashland NW Alignment	5	open & enclosed	Visibility in Ashland enclosed by structures and vegetation; views to residential, commercial, and industrial land uses	Foreground; highway will cross over railroad; railroad visible for about 1.0 mile	x	x					very low	low
FAS 566 (south of Ashland)	1,4	open	Viewshed orientation--Tongue River; current setting predominantly natural, with agriculture	Foreground; railroad will parallel road for 5.5 miles	x	x		x	x		moderate	moderate
FAS 566 (remainder)	4	open	Viewshed orientation--plateau; current setting predominantly natural	Foreground; railroad will cross road and parallel for 1.5 miles; railroad visible for 2.5 miles	x	x		x	x		moderate	moderate
FAS 566 assuming Ashland NW Alignment	4	open	Viewshed orientation--Tongue River; current setting predominantly natural, with agriculture	Foreground; railroad will cross road; railroad visible for 1.0 mile	x	x					very low	moderate
FAS 477	1,4	open	Viewshed orientation--Tongue River and steep ridges; current setting predominantly natural, with agriculture	Middleground; 1.0 plus miles east for approximately 7.5 miles		x	x		x		very low	low
FAS 332 (Tongue River Road)	1,3,4	open	Viewshed orientation--Tongue River and steep ridges; current setting mixture of natural landscape and agricultural characteristics	Foreground; route parallel road to west for 38 miles; Middleground/Background; .8 to 1.5 miles east for approximately 9.5 miles	x	x	x		x		very low	moderate
King Creek Road	4	open	Visibility along road confined by surrounding ridges to the north and south; natural setting; limited views to Tongue River at west end of road	Foreground; railroad and road intersect; railroad visible for approximately .5 mile	x	x			x		low	moderate
RESIDENTIAL - EXISTING												
Ashland	5	open & enclosed	Variable visibility; views to southeast and east significantly limited by vegetation	Middleground; .5 les east of Mission area and .5 miles southeas. of Ashland center		x		x			very low	low
Ashland assuming Ashland NW Alignment	5	open & enclosed	Variable visibility; existing roads, residential, industrial, and commercial uses predominate visual character	Foreground; crosses through ashland; Middleground; about .5 miles east of Mission	x	x		x		x	moderate	high
RESIDENTIAL - PLANNED												
Ashland (Tranel Subdivision)	5	open	About 5 houses--subdivision; elevated with panoramic views	Foreground; crosses through area	x	x	x				moderate	high
Ashland assuming NW Alignment (Tranel Subdivision)	5	open	About 5 houses--subdivision; elevated with panoramic views	Foreground; crosses through area	x	x	x	x	x	x	moderate	high
Ashland assuming NW Alignment (Snowgrass Subdivision)	5	open & enclosed	Variable visibility; views to north and northwest limited by topography, structures	Foreground/Middleground; .3 to 1 mile northwest of planned residential area	x	x		x		x	low	low
Powder River County (Trusaler Subdivision)	1,4	open & enclosed	Visibility variable due to topography and vegetation; subdivision undeveloped; current setting natural and agricultural	Foreground; crosses southern edge of subdivision	x	x		x			low	moderate

[a] Landscape Character Subtypes:
(1) Tongue River and Creek flood plains
(2) Yellowstone River flood plains
(3) shrub/grassland prairie
(4) ponderosa pine/upland slopes and mesas
(5) developed rural community
(6) developed urban area
(7) developed heavy-industrial/urban area

[b] Project Components:
RR/TR = Railroad and Transmission
T = Trains
S = Sidings
B = Bridges
C = Cuts
F = Fills

the high impacts associated with the proposed railroad. West of the Colstrip alternative route's intersection with the proposed railroad, the alternative would incur 2.1 miles of moderate impacts generated by the following operations:

(1) The removal of portions of four stands of ponderosa pine.

(2) A cut 125 feet high and 1,000 feet long, located near the route's entrance to the Tongue River flood plain.

(3) A 140-foot bridge and fill constructed across the Rosebud Creek flood plain.

The remaining 3.4 miles of moderate impacts along the Colstrip alternative route involve the large cuts and fills and the removal of the ponderosa pine stands that were described for the proposed railroad. This route would not include the fill at Miles City.

Low and very low impacts would affect the landscape's scenic quality along the greatest portion of the Colstrip alternative route. Low impacts primarily would occur in the ponderosa pine/upland slopes and mesas landscape character subtype. Very low impacts would result where the alternative route parallels Rosebud County Road FAS 447, as well as along graded and unpaved roads in the Tongue River and the Otter Creek flood plains.

A13.4.2.2 Impacts to Sensitive Use Areas

The Colstrip alternative route would be visible from nine (9) SUAs, as depicted in Table A13-6. Running parallel to FAS 477 for 3 to 13 miles, the alternative would exert low impacts from 1987 to 1996, and moderate impacts after 1996. The Colstrip alternative route would produce low visual impacts on Rosebud County Road FAS 332.

A13.4.2.3 Mitigative Measures

The mitigation recommendations for the Colstrip alternative route are the same as those measures described for the proposed railroad.

A13.4.3 Related Actions

The impacts from the related actions would be the same for the Colstrip alternative as those discussed for the proposed railroad.

TABLE A13-6

VISUAL CONTRAST RATINGS--SENSITIVE USE AREAS: COLSTRIP ALTERNATIVE

COLSTRIP ALTERNATIVE SENSITIVE USE AREA (SUA)	EXISTING SUA VIEWSHED CHARACTERISTICS LANDSCAPE CHARACTER SUBTYPE[a]	VISIBILITY	VIEW ORIENTATION/CULTURAL MODIFICATIONS	POTENTIAL PROJECT VISIBILITY CHARACTERISTICS DISTANCE	PROJECT COMPONENTS[b] RR/TR	T	S	B	C	F	VISUAL CONTRAST 1986/87 to 1996	 1996 to 2011
TRANSPORTATION												
State Highway 212	1,4,5	open & enclosed	Viewshed orientation--Otter Creek; current setting predominantly natural with agriculture	Foreground; railroad will cross over highway; along Otter Creek line, railroad will cross under highway; railroad visible for .8 mile but along Otter Creek Line railroad visible for 1.8 miles of highway	x	x		x	x	x	moderate (low Otter Creek)	moderate
State Highway 212 assuming Ashland NW Alignment	5	open & enclosed	Visibility in Ashland enclosed by structures and vegetation; views to residential, commercial, and industrial land uses	Foreground; highway will cross over railroad; railroad visible for about 1.0 mile	x	x					very low	low
FAS 565 (south of Ashland)	1,4	open	Viewshed orientation--Tongue River; current setting predominantly natural with agriculture	Foreground; railroad will parallel road for 5.5 miles	x	x		x	x		moderate	moderate
FAS 565 (remainder)	4	open	Viewshed orientation--plateau; current setting predominantly natural	Foreground; railroad will cross road and parallel for 1.5 miles; railroad visible for 2.5 miles	x	x			x		moderate	moderate
FAS 565 assuming Ashland NW Alignment	4	open	Viewshed orientation--Tongue River; current setting predominantly natural with agriculture	Foreground; railroad will cross road; railroad visible for 1.0 mile	x	x					very low	moderate
FAS 477	1,4	open	West of Tongue River Road intersection: views are primarily natural landscape; subtype No. 3; south of Tongue River Road intersection: views predominantly natural and agricultural areas	Foreground; parallels road for 3.0 miles; Middleground/Background; 1.0 miles east for approximately 13 miles	x	x	x	x	x	x	low	moderate
FAS 332 (Tongue River Road)	1,4	open	Viewshed orientation--Tongue River and steep ridges; current setting mixture of natural landscape and agricultural areas	Foreground; .2 miles west for approximately 3.0 miles	x			x	x		low	low
King Creek Road	4	open	Visibility along road confined by surrounding ridges to the north and south; natural setting; limited views to Tongue River at west end of road	Foreground; railroad and road intersect; railroad visible for approximately .5 mile	x	x			x		low	moderate
RESIDENTIAL - EXISTING												
Ashland	5	open & enclosed	Variable visibility; views to southeast and east significantly limited by vegetation	Middleground; .5 miles east of Mission area and .5 miles southeast of Ashland center		x		x			very low	low
Ashland assuming Ashland NW Alignment	5	open & enclosed	Variable visibility; existing roads, residential, industrial, and commercial uses predominate visual character	Foreground; crosses through Ashland; Middleground; about .5 miles east of Mission	x	x		x		x	moderate	high
RESIDENTIAL - PLANNED												
Ashland (Tranel Subdivision)	5	open	About 5 houses--subdivision; elevated with panoramic views	Foreground; crosses through area	x	x	x				moderate	high
Ashland assuming NW Alignment (Tranel Subdivision)	5	open	About 5 houses--subdivision; elevated with panoramic views	Foreground; crosses through area	x	x	x	x	x	x	moderate	high
Ashland assuming NW Alignment (Snyglass Subdivision)	5	open & enclosed	Variable visibility; views to north and northwest limited by topography, structures	Foreground/Middleground; .3 to 1 mile northwest of planned residential area	x	x		x		x	low	low
Powder River County (Trussler Subdivision)	1,4	open & enclosed	Visibility variable due to topography and vegetation; subdivision undeveloped	Foreground; crosses southern edge of subdivision	x	x		x			low	moderate

[a] Landscape Character Subtypes:
(1) Tongue River and Creek flood plains
(2) Yellowstone River flood plains
(3) shrub/grassland prairie
(4) ponderosa pine/upland slopes and mesas
(5) developed rural community
(6) developed urban area
(7) developed heavy-industrial/urban area

[b] Project Components:
RR/TR = Railroad and Transmission
T = Trains
S = Sidings
B = Bridges
C = Cuts
F = Fills

A13.5 FOOTNOTES

1. A character type is defined as an area of land that has common distinguishing visual characteristics of landform, rock formation, water forms, and vegetation patterns. It is comprised of physiographic sections defined by Nevin M. Fenneman. Landscape character subtypes are divisions of major character types that are significantly different in visual character. They are used to identify portions of major character types having different degrees of visual diversity. The degrees of visual diversity area termed "variety classes" in the VMS system. There are three variety classes recognized by the U.S. Forest Service: Class A, distinctive; Class B, common; Class C, minimal. The VRM program also bases the evaluation of scenic quality of landscapes within the context of physiographic provinces defined by Fenneman. Three classes of scenic quality are recognized: Class A, outstanding; Class B, combination of common and outstanding features; Class C, common. The U.S. Forest Service system (VMS) rates most land as Class B while the BLM system (VMR) allows a greater proportion of public land to be categorized Class C.

2. U.S. Department of Agriculture, Forest Service, National Forest Landscape Management, Volume 1, Agricultural Handbook No. 434 (Washington, DC: Government Printing Office, Feburary, 1973), and Volume 2, Chapter 1, "The Visual Management System," Agricultural Handbook No. 462 (Washington, DC: Government Printing Office, April 1974).

3. Ibid.; U.S. Department of Interior, Bureau of Land Management, "Visual Resource Contract Rating," Manual Transmittal Sheet 8431, 1978; U.S. Department of Interior, Bureau of Land Management, Division of Recreation and Cultural Resources, Visual Resource Management Program, No. 024-011-0016-6 (Washington, D.C.: Government Printing Office, 1980), pp. 13, 18, 22, 24, 30.

4. Three of the cuts occur in the southern part of the study area, in parts of the ponderosa pine/upland slopes and mesas (Class B) landscape character subtype; the fourth is located to the north, in shrub/grassland prairie (Class C) landscape.

5. Those population centers expected to experience growth in association with the mining operations are Ashland, Broadus, Birney, Colstrip, and Miles City. Of these centers, Ashland and Broadus are projected to exhibit the greatest amount of growth.