CHAPTER 3

DESCRIPTION OF THE AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the affected environment for the area of the Powder River Region that is necessary for assessing effects of the No-Action Alternative in Chapter 4. Climate, physiographic province, geologic structure, fisheries, prime farmland, wetlands, floodplains, and threatened or endangered plant species either would not be regionally affected or do not occur within the region. Therefore, no assessments on these elements were deemed necessary.

Areas of land have been identified as possible alluvial valley floors (AVFs). Although these possible AVFs are not excluded from consideration for leasing, the OSM would make a final determination prior to the mine and reclamation plan approval regarding their existence and whether mining would be permitted in that area of the tract. Individual tract profiles (Northwest Otter Creek, Southwest Otter Creek, Ashland (Decker-Birney), Keeline, Kintz Creek, and Duck Nest Creek) show location of these possible AVFs (BLM, 1981).

GEOLOGY AND OTHER MINERALS

The economic coal beds are found in the Tongue River member of the Paleocene (65 to 55 million years ago) Fort Union Formation and the Eocene (55 to 38 million years ago) Wasatch Formation. Description and relationships of the coal bearing formations may be found in Brown (1962), and Matson and Pinchock (1977).

Faults and folds are rare and mostly confined to the west flank of the region along the edge of the Bighorn Mountains. The region is classified as aseismic (no earthquake tendency) (Simon, 1972).

The coal beds found in the region are generally thick and of very wide areal extent. Detailed discussions concerning the quantity, quality, correlations, and locations of the coal beds may be found in Glass (1976 and 1980); Matson and Blumer (1973); Matson and Pinchock (1977); Cole, Matson and Pederson (1980); and the Tract Profiles (BLM, 1981).

Abundant plant and invertebrate fossils are found in the Tertiary coal bearing rocks. Vertebrate of other significant fossils are rare and known from only a few locations. Those known fossils contained within the region have no exceptional scientific interest or value (BLM, 1979a; USGS, 1979).

Other minerals of economic importance found in the region are oil and gas, uranium, and bentonite (see discussion in Chapter 1).

WATER RESOURCES

Most of the water used in the Powder River Region comes from the Yellowstone River and its tributaries the Tongue River and Powder River; and the Cheyenne River and its tributary the Belle Fourche River; and the North Platte River. The discharge of these streams is adequate to supply present needs within the region. Total water use in 1980 was about 518,140 acre-feet. The largest use, 81 percent, was for irrigation. Coal mining used 1,700 acre-feet, and municipal water use was 23,000 acre-feet. About 70 percent of the municipal water used is discharged as treated sewage effluent (BLM, 1979a).

Ground Water

The occurrence of ground water within the Montana and Wyoming areas of the Powder River Region is similar and therefore both areas will be assessed as a single unit. Ground water is used for domestic and stock watering, municipal supplies, secondary recovery of oil, irrigation, mining, milling, and other industrial uses.

Aquifers are contained in formations with a total thickness of more than 9,000 feet. The deepest aquifers are in the Madison aquifer system that includes geologic units from Precambrian-age basement rocks to Cretaceous-age shales (BLM, 1981, pp. 3-2). The most important aquifer within this system is the Madison Group, which is present in an area of over 180,000 square miles including the Powder River Region. The Madison aquifer is composed almost entirely of carbonates that are mostly dense with low porosity and permeability. However, well developed zones of secondary porosity and

permeability and localized beds of coarsely crystalline dolomite exist. Yields of more than 1,000 gallons per minute (gpm) are available where caverns, fractures, and crystalline zones are present; where they are absent, yields are much lower.

Most of the recharge to the Madison aquifer system is in outcrop areas in the Black Hills and Bighorn Mountains. The water becomes progressively more mineralized with increasing distance from the recharge areas. Discharge is from springs, wells, and seepage into stream valleys.

Water from the Madison aquifer system is used by the towns of Douglas and Gillette, Wyoming.

A sequence of Cretaceous shale up to 5,500 feet thick with very low vertical hydraulic conductivity overlies the older rocks, including the Madison aquifer system. These shales serve to separate the Madison aquifer system from shallow aquifers. The shallow aquifers are contained in the Fox Hills Sandstone and Hell Creek, Fort Union, Wasatch, and Lance Formations. (BLM, 1979a, Figure R2-4).

Ground water in the above formations is available at relatively shallow depths in most of the region in sufficient quantity for domestic and stock watering uses. The quality of the water in shallow aquifers is highly variable. Larger yields and better quality water are usually more available in the lower part of the shallow aquifers than in the upper part. Stock and domestic wells are commonly less than 1,000 feet deep and yield about 25 gpm. Industrial and municipal wells are commonly deeper than 1,000 feet and are often 3,000 to 5,000 feet deep and open to several formations. These deeper wells can yield more than 100 gpm.

The aquifers most commonly used in the region are sandstone and coal beds in the dominantly fine-grained Fort Union Formation. (USGS, 1979, pp. II-18.) The sandstone beds are lenticular and generally do not extend more than a few miles; whereas, coal aquifers are more areally extensive. The Fox Hills-Hell Creek aquifer, which underlies the Fort Union Formation, is the most extensive unit where yields of 100 to 200 gpm can be obtained. Clinker zones in the Fort Union Formation are very permeable; however, they are usually above the water table.

Recharge to the shallow aquifer system is mainly in upland areas through sandy zones of the Fort Union Formation, coarse-grained alluvium, and clinker.

Downward movement of recharge water in the shallow aquifer system is retarded by shale layers of low permeability causing the static water level in wells in recharge areas to be progressively lower with increasing depth of the well. Pumping lifts in deep wells may be several hundred feet greater than in adjacent shallow wells. Perched zones are common, and where impermeable beds are exposed, ground water is discharged as seeps and springs.

The chemical quality of the water from the shallow aquifers is highly variable. DS concentration ranges from 100 to more than 8,000 mg/L, but Hodson and others (1973) state that the DS content of water from most wells is between 500 and 1,500 mg/L. As water moves downward through the formations, the chemical type is changed by cation-exchange softening and sulfate reduction. The water from wells less than 200 feet deep generally is hard (calcium-magnesium-sulfate type) whereas, water from deeper wells generally is soft (sodium-bicarbonate type) (BLM, 1979a, Fig. R2-12). Water from the deeper wells is typically lower in total DS, indicating that precipitation occurs as the water moves downward. Ranges of trace elements and radiochemical analyses of water from shallow aquifers in Wyoming are given in the Eastern Powder River Coal ES (BLM, 1979a, Table R2-7).

Quaternary alluvium contains the shallowest aquifers in the region. Most alluvium is too fine-grained to yield much water; however, clean, coarse-grained material along rivers may yield up to several hundred gpm. Recharge to alluvial aquifers is from precipitation, runoff, and upward seepage from underlying formations. Discharge is by evapotranspiration, seepage into streams, pumpage, or ground water flow to older formations.

The water table in alluvial aquifers can slope toward or away from a stream depending on whether the stream is gaining or losing water in that area.

The quality of the water in most alluvial aquifers is poor, with DS concentration exceeding 8,000 mg/L. The chemical type of the water is similar to that in the upper part of the shallow aquifers but may be higher in DS due to concentration by evapotranspiration

Municipal water supplies within the towns of Ashland, Broadus, and Gillette are adequate for the present population.

In some areas of Wyoming, uranium mining may result in serious and long-lasting degradation of water quality. Leachate from tailing ponds is well beyond the safe limits of radioactivity for animals or humans. Stock or humans using water from wells or streams down gradient could be exposed to dangerous levels of radioactivity. Increasing the danger is the nondegradable and cumulative character of this type of contamination. Plants, crops, and river biota accumulate and concentrate radium 226. Levels of radium 226 in some wells near uranium mines vary from less than 10 to 50 picocuries per

liter, and surface-water levels are as high as 35 picocuries per liter. U.S. Public Health Service limits are 3 picocuries per liter.

Surface Water

Montana

The major tributaries to the Yellowstone River that drain the Montana part of the region are Armells and Rosebud creeks and the Tongue and Powder rivers. Pumpkin, Otter, and Hanging Woman creeks are major tributaries to the Tongue River, and Mizpah and the Little Powder River are major tributaries to the Powder River. Streams that are perennial, or nearly so, include the Tongue and Powder rivers and Rosebud, Otter, and Hanging Woman creeks. Many streams are ephemeral (flow in response to rainfall or snowmelt). However, most stream channels have intermittent reaches that flow for long periods each year at very low rates.

The average runoff ranges from about 0.01 cubic feet per second per square mile (cfsm) to 0.06 cfsm from the larger drainages with the exception of the Tongue River which averages 0.35 cfsm at the state line near Decker, and 0.08 cfsm at Miles City. High runoff usually results from snowmelt and spring rains, and the extreme low-flow period is from October through January. Average flow for the Yellowstone River at Miles City is 11,605 cubic feet per second (cfs) (USGS, 1980a). Surface runoff is depleted by numerous stock-water reservoirs and spreader systems on small tributaries. Much of the flow that originates within the region is depleted by storage, evapotranspiration, and seepage.

The chemical quality of water in most small streams is poor most of the time (BLM, 1979a). The base-flow component (water that enters streams from the ground water system) of streams that drain the more arid areas contain DS concentrations ranging from 1,500 to 5,000 milligrams per liter (mg/L), mainly sodium sulfate. Rosebud Creek and the Tongue River are the only major streams that regularly contain DS concentrations less than 1,000 mg/L, mainly calcium bicarbonate; however, water in the Tongue River deteriorates in the downstream direction owing to irrigation return water that contains greater concentrations of DS, mainly sodium sulfate (BLM, 1979a). DS for the Yellowstone River averages about 480 mg/L below Miles City. Sediment yields range from 0 to 1.2 acre-feet per square mile per year (BLM, 1981). Fecal coliform count in colonies per 100 milliliters for October 1978 through September 1979 ranged from 960 to 30 in the Tongue River at the state line near Decker and 18 to 2 in the Yellowstone River at Forsyth (USGS, 1980a).

Wyoming

The Wyoming area of the region is drained to the east by the Belle Fourche and Cheyenne rivers, to the north by the Little Powder River, to the west by tributaries to the Powder River, and to the south by tributaries to the North Platte River. Most streams are ephemeral. However, many stream channels have intermittent reaches that flow for long periods each year at very low rates. Streams seem to be drier (closer to truly ephemeral) in the southern part of the region and become progressively wetter to the north (BLM, 1979a).

The average runoff ranges from about 0.01 to 0.02 cfsm from the larger drainages. The flow of the North Platte River at Casper, which is partially controlled by reservoirs, averaged 1,360 cfs in 1979. High runoff usually results from snowmelt and spring rains, and the extreme low-flow period is from October through January. Surface runoff from the region is depleted by numerous stock-water reservoirs and spreader systems on small tributaries (BLM, 1979a). Much of the flow that originates within the region is depleted by storage, evapotranspiration, and seepage. The quantity of flow that leaves the eastern Powder River Region via the large streams represents about 42 percent of the flow that originates on each square mile within the region (BLM, 1979a).

The chemical quality of water in most streams is poor most of the time. The base-flow component (water that enters streams from the ground water system) of most streams contains DS concentrations ranging from 1,500 to 5,000 mg/L, mainly sodium sulfate. DS for the North Platte River averages about 400 mg/L below Casper. Fecal coliform count in colonies per 100 milliliters for October 1978 through September 1979 ranged from 130,000 to 12,000 in Goose Creek below Sheridan, 10,000 to 11 in the North Platte River below Casper, 670 to less than 1 in the Cheyenne River near Riverview, 600 to 2 in the Belle Fourche River below Moorcroft, and 120 to 2 in the Little Powder River above Dry Creek near Weston (USGS, 1980b). Sediment yields range from about 0.1 to 3 acre-feet per square mile per year (BLM, 1979a).

AIR QUALITY

A detailed description of air quality in the region may be found in the Technical Report available from the Casper District BLM Office (Radian, 1980).

Background concentrations for TSP, NO_2, SO_2, non-methane hydrocarbons (NMHC), and ozone

(O_3) were generated from monitoring data obtained within the region. Data on other criteria pollutants, carbon monoxide (CO) and lead (Pb), were gathered from nearest available sites, which are Billings, Montana (about 120 miles from Ashland, Montana), and Steamboat Springs, Colorado (about 400 miles from Gillette, Wyoming), respectively (Radian, 1980).

The region is a Federal Class II PSD area. However, the Northern Cheyenne Indian Reservation, which is a Class I PSD area, is bordered by the region on the north, east, and south sides.

Appendix A (Table A-1) shows the maximum allowable increases for the PSD of air quality. Appendix A (Table A-2) shows the federal, Montana, and Wyoming ambient air quality standards.

The rural TSP annual geometric mean for the region is about 16 $\mu g/m^3$. In and near populated areas and existing industrial activities, particulate levels are significantly higher than background levels. Particulate readings near existing mining activities are higher than background levels due to fugitive dust generated by mining operations. TSP returns to rural background levels several miles downwind as a result of particulate deposition.

Violations of the annual and 24 hour TSP standard occurred in 1979. In Wyoming the east monitor site at Black Thunder Mine exceeded annual and 24 hour TSP standards (412 and 113 $\mu g/m^3$, respectively). The Belle Ayr Mine sites 4 and 5 and Eagle Butte site 4 exceeded the 24 hour TSP standard (188, 167, and 152 $\mu g/m^3$, respectively). In Montana, the Colstrip area does not meet NAAQS for particulate and has been designated a nonattainment area.

Rural annual SO_2 and NO_2 background levels are about 1 and 16 $\mu g/m^3$, respectively. The 3-hour national standard for NMHC was exceeded five times at Colstrip in 1976 with a maximum of 0.87 parts per million (ppm). These high readings are attributed to heavy vehicular traffic primarily in the early morning. CO, Pb, and O_3 concentrations were less than 50, 80, and 75 percent, respectively, of the NAAQS.

Visibility greater than 60 miles is common. Significant reductions in visibility are generally weather related.

SOILS, VEGETATION, AND RECLAMATION

Soils of the region have developed mostly with short-grass vegetative cover common to the semiarid Great Plains. Due to prevailing climate and vegetative conditions, organic matter is accumulated slowly, and soils have developed with light-colored surfaces. Light colored soils generally indicate low organic matter content and fertility levels. Subsoil colors are normally light brown or reddish brown, and are often influenced by white, powdery carbonate accumulations caused by low rainfall and insufficient leaching. Soils of the region are mostly residual (developed in place) and formed from weathered sedimentary bedrock, mostly sandstone and shale. Most soils in the region have a fairly good reclamation potential based on reclamation success of other mines in the region. The "fairly good" category means on a scale of 1 to 10 these soils rate a "7". Site-specific information on soils and reclamation potential is available in the Tract Profiles (BLM, 1981); Wyoming General Soils Map (University of Wyoming, 1977); and *Rehabilitation Potentials and Limitations of Surface-Mined Land in the Northern Great Plains* (Packer, 1974).

The major vegetation types in the Powder River Region are shown on Table 4-3, along with acreage. Refer to the Tract Profiles (BLM, 1981) for vegetation map and common species list for the vegetative types. No threatened or endangered plant species have been identified within the region (BLM, 1981; Dorn, 1980).

WILDLIFE

Physical boundaries used in assessing wildlife impacts are the Decker, Colstrip, and Otter Creek areas in Montana, and antelope (and corresponding deer) hunt areas 24 and 101 (21), 17, 18 and 19 (17 and 18) and 23 (19 and 20) in Wyoming (see Appendix B). Acres of habitat for these areas are shown on Table 3-1.

Montana

Detailed population data is not available for Montana.

In the Colstrip area big game may well be below their numbers of 1976 following the two severe winters of 1977-78 and 1978-79 (Wentland, 1980). Mule deer habitat use is heaviest in areas south and east of Colstrip. This area is fair to poor antelope habitat. Mule deer are common on the breaks along both sides of Otter Creek. Most deer appear to winter on the Custer National Forest. Antelope are common on the midslope areas between Otter Creek valley and the National Forest boundary. The heaviest yearlong concentration in the Otter Creek

area appears to be on the west side of the creek, south of the confluence of Three Mile Creek and Otter Creek (Martin, 1980). The West Decker and Spring Creek mines include or are directly adjacent to important winter mule deer and antelope range. During the severe winter of 1977-78, approximately 405 mule deer and 375 antelope used these areas (Phillips, 1979).

Sharp-tailed grouse are abundant (11 leks) in the Colstrip area. The habitat consists of pine groves which provide escape and thermal cover while native grasslands and cultivated lands provide nesting cover and food habitat. The grouse have established new leks on unmined areas near Colstrip Mine and are nesting on successfully reclaimed areas. Twenty sharp-tailed grouse leks have been located in the Otter Creek area. This amounts to .22 leks per square mile compared to .12 leks per square mile in the Colstrip area. Average male attendance was about 18 per lek in 1980 (Martin, 1980). One sage grouse lek exists on the Spring Creek lease, but under mitigation agreement between Montana Fish and Game Department and NERCO, this lek area was determined unsuitable for mining with the exception applied (personal communication, Richard Zander, BLM, Miles City, 1981).

Red-tailed hawks are the most common raptor in the Otter Creek area with eight nests known to occur. Seven golden eagle nests are in this area but only one nesting pair was observed in 1980. Two prairie falcon eyries exist with one being active in 1980 (Martin, 1980).

The bald eagle is a winter resident of the area. Peregrine falcons are likely spring and fall migrants through the area. Black-footed ferrets may occur in the area in and near black-tailed prairie dogtowns.

Wyoming

The majority of coal mining related surface disturbance is occurring in antelope hunt areas 24 and 101 with six mines operating in the area (Appendix B (Figure B-1), and the Regional Activity Map). The Gillette-Orin Junction main line railroad bisects these two areas, and because it is fenced, it severely restricts east-west movement. Access roads to the mines intersect the railroad seven times and subdivide hunt area 24 into several small pastures. Movement between these pastures is severely restricted by traffic, fences along access roads, and the railroad. Seasonal movement is southward in the fall and northward in the spring. Approximately 200 to 300 antelope have wintered in the vicinity of Keeline and Kintz Creek tracts.

Two mines are currently located in antelope hunt area 17 north of Gillette. Antelope distribute evenly throughout hunt area 17 with exceptions of the scoria hills and timbered areas along the Little Powder River which are occupied infrequently.

Mule deer use (deer hunt area 18) is heaviest in the rough scoria hills and timbered breaks along the Little Powder River. White-tailed deer are common in the Little Powder River valley. However, both species show little seasonal movement.

Population trends of big game are presented in Table 3-2. Most big game herds in northeastern Wyoming suffered heavy winter losses following the winters of 77-78 and 78-79.

Sage grouse are the most common upland game bird in Campbell County. Forty-one leks are known to exist in the county with 16 of these existing in the area southeast of Gillette (antelope hunt areas 24 and 101). Five of these leks have been abandoned and two others destroyed by coal mining related activities since 1975 (Wyoming Game & Fish, 1979c). Sharp-tailed grouse are common in the northern half of Campbell County with three lek sites known. Data for the remainder of the county are not available.

Golden eagles, red-tailed hawks, ferruginous hawks, and great-horned owls are the most common nesting raptors in Campbell County. Available data indicate a minimum of 90 pairs of nesting golden eagles, 21 pairs of red-tailed hawks, and 21 pairs of great-horned owls. There are 13 pairs of golden eagles nesting on or within ½ mile of active mines or areas leased for further development.

The bald eagle and the black-footed ferret are listed as endangered by Fish and Wildlife Service and occur within Campbell County. The bald eagle is a common winter resident. The black-footed ferret is considered rare since there have been few reported sightings. However, no habitat has been designated as critical for either of these threatened or endangered species. No other threatened or endangered animal species are known to exist in the Wyoming area.

CULTURAL RESOURCES

Cultural resources within the region include evidence of man's activities for the past 12,000 years (BLM, 1979b, pp. 4-27). Specific types of cultural resources known are stratified sites resulting from repeated occupation of a locality, bone beds from communal hunts when large numbers of animals were killed, stone circles generally known to be associated with skin-covered dwellings of late prehistoric and historic Indians, rock art, ceramic sites

where pottery is found, quarries where raw material for stone tools was collected, lithic scatters that provide evidence of short-term subsistence activities, rock shelters, burials, rock cairns or piles of rocks of debatable function, battlefields, homesteads, mines, and trails (BLM, 1979a; USGS, 1979). Appendix C shows the identified cultural sites for the Powder River Region.

VISUAL RESOURCES

Intrusions in an area affect the form, line, color, and texture of the landscape. Intrusions are classified as high, medium and low depending upon the amount of contrast with the existing landscape. Intrusions of high contrast would include open pits, coal silos and conveyors, structures on the skyline, large reflective surfaces, and large areas of surface disturbance. Intrusions of medium contrast would include access and haul roads, railroad lines, power lines, drilling rigs, and oil wells. Intrusions of low contrast would include fence lines, pipelines, and small areas of surface disturbance.

Montana

This area is characterized by rolling uplands dissected by steep-sided valleys. Local rugged hills and ridges are capped by resistant sandstone and clinker. Badlands have been formed in easily eroded shales. The region is drained by northward flowing tributaries of the Yellowstone River (see Regional Activity Map). Scenic quality ratings and management classes have not been established for this area of Montana; however, potential is for scenic quality Classes B and C, and management Classes III and IV with some areas of Class II possible (VRM Manual 8400 and Appendix D).

Wyoming

This area is characterized by low rolling hills and flat plains sometimes broken by canyons, buttes, and breaks. Scoria outcrops provide some reddish contrast to the landscape. Water is scarce and rarely a dominant feature. This area is largely scenic quality Class B or C and management Class III or IV. A management class map for Campbell and Converse counties is included in the Eastern Powder River Coal ES (BLM, 1979a).

LAND USE

Agriculture is the primary land use in the region (USGS, 1979). Most of the land is used as range for cattle and sheep. Farming consists mainly of dryland hay, both grass and alfalfa, or grain. Some flood irrigation of hay and grain fields occurs along stream bottoms. Other land uses and designations include mining, oil and gas, transportation networks, national forest, Indian reservations, recreation areas, and urban areas.

Agriculture

In Montana 87 percent of the land in the counties within the region is used for agricultural purposes (USDA, Montana Department of Agriculture, 1978). Of that total land, 88 percent is rangeland, 6 percent dryland farming, 1 percent irrigated and the remainder miscellaneous agricultural uses. The acres within these types of land uses are shown on Table 3-3 by county. Productivity on these lands can only be estimated because of flucuations caused by climate, markets, and operational decisions. In 1979 there were about 279,000 cattle within the region. Cropland productivity average is 1.9 tons per acre for hay, 25.0 bushels per acre for wheat, 35.8 bushels per acre for barley, and 45.3 bushels per acre for oats based on 1979 crop production figures.

Also, in Wyoming 87 percent of the land in the counties within the region is used for agricultural purposes (USDA Wyoming Crop Production Reporting Board, 1978). Of that, rangeland for cattle and sheep accounts for 90 percent, dryland farming 5 percent, irrigated land 1 percent and the remainder is in miscellaneous agricultural uses. The acres within these types of land uses are shown on Table 3-3 by county. Productivity on these lands can only be estimated because of flucuations caused by climate, markets, and operational decisions. In 1979 there were approximately 438,000 cattle in Wyoming. Cropland productivity average is 1.48 tons per acre for hay, 22.5 bushels per acre for wheat, 30.2 bushels per acre for barley and 44.2 bushels per acre for oats based on 1979 crop production figures.

There are no prime farm or wet lands (USDA, SCS, 1981).

Other Land Uses

Land use for oil and gas, power plants, refineries, and mining of coal, bentonite and uranium is increasing in the region. In 1980, 76,338 acres in Wy-

oming and 23,519 acres in Montana were included in these types of activities.

RECREATION

The Powder River Region is comprised mostly of privately owned surface, which limits public access and use. Recreational use is confined to the developed sites in the region or the national forests on the fringes of the region. The present number of facilities are adequate to meet current use or demand.

Montana

Hunting occurs throughout the area and receives more participation than any other single recreational activity. Big game hunter success is high (see Appendix E); approximately 75 percent for antelope (Montana Fish and Game, 1978). Other outdoor recreation opportunities include fishing, water sports, camping, picnicking, hiking, winter sports, historic interpretation, and municipal parks (Montana Fish and Game Department, 1978; USDA, Committee for Rural Development, 1975; USDA, Big Horn County Committee for Rural Development, 1976; USDA, Soil Conservation, 1976; USGS, 1979).

Although there are no designated wilderness areas, the Forest Service (FS) has a wilderness proposal, the Tongue River Breaks Roadless Area, in Custer National Forest (USDA, RARE II, 1979). Also, BLM has three proposed wilderness areas: the Tongue River Breaks Contiguity (adjacent to the FS proposal), Zook Creek, and Buffalo Creek (both located between Ashland and Decker) (BLM, 1980a).

Wyoming

Like Montana, hunting is the major recreational activity with high success ratio of hunters to harvest (over 90 percent for antelope) (see Appendix E). A like variety of outdoor recreation opportunities are also available (BLM, 1979a; Wyoming Recreation Commission, 1975 and 1980; Wyoming Game and Fish, 1977a and b, 1978a and b, 1979a and b, Campbell County Recreation Board, 1974; City of Gillette, 1978).

The FS has proposed the Laramie Peak (Medicine Bow National Forest) and the Seven Brothers (Bighorn National Forest) wilderness areas (USDA, RARE II, 1979). The Cloud Peak primitive area is managed by the FS (Bighorn National Forest). BLM has three areas under study for possible wilderness designations: Fortification Creek (west of Gillette), Gardner Mountain and the North Fork of the Powder River (both located south of Buffalo) (BLM, 1980b). BLM also has a special management unit: the Middle Fork of the Powder River.

TRANSPORTATION

Railroads

BN operates three main lines on which unit trains travel within the Powder River Region. The northern line runs through Billings and Miles City, Montana, and into North Dakota and Minnesota. The central route runs through Sheridan and Gillette, Wyoming, and into Nebraska, Iowa, Missouri, and Illinois. The southern route runs through Orin Junction and Guernsey, Wyoming and into Nebraska and Colorado. The number of TPD along these lines in 1981 are shown on Table 3-4. These trains reflect both freight/passenger and unit coal train traffic loaded and empty.

A unit train, which contains 100 cars with a capacity of 100 tons each, is approximately 1 mile in length. At any given crossing it would take a unit train 3 minutes to pass traveling at 20 miles per hour and 12 minutes at 5 miles per hour (BLM, 1979a). At these two speeds, a crossing on the central route leaving the region would be interrupted for 1 hour 12 minutes and 4 hours 48 minutes, respectively. Data are unavailable for car-train accident rates for specific at-grade crossings. An average rate for a crossing with flashing lights has been predicted for a traffic volume of 1,000 motor vehicles per day. Table 3-4 shows the existing situations at four selected cities located along BN main lines.

Two proposed railroad lines, the Tongue River Railroad along the Tongue River in Montana and the Chicago Northwestern/Union Pacific line in southeast Wyoming, would also handle coal traffic.

Highways

In Montana, the major trafficways are Interstate 94, U.S. Highway 212, Federal Aid Primary (FAP) 39, U.S. Highway 312, and FAP 92. Outlying areas are connected by a system of county, FS, Indian reservation, and private roads. Appendix F (Figure F-1) shows the interstate, state, and federal aid primary and secondary road systems, and average daily traffic (ADT). Highway 212 from Ashland through the Northern Cheyenne Indian Reservation

contains potholes, ruts, and shoulder deterioration creating traffic safety and nuisance problems. The Native Americans along with other local residents are concerned about the problems caused by heavy truck traffic along this route. The same situation exists along FAS 314 between 212 and Decker. This road was once surfaced but large traffic volumes and heavy loads have deteriorated it. This road is also a traffic safety and nuisance problem (Northern Cheyenne and Crow tribal councils).

In Wyoming, the major north-south trafficways are Interstate 25 and State Highway 59 (Regional Activity Map). East-west travel is largely on Interstate 90, U.S. 16, State Highway 387, and State Highway 20/26. Appendix F (Figure F-2) shows interstate, U.S., and state highways, and the ADT for the Wyoming area. A network of county and private roads connect outlying areas to these major transportation routes. There are grade separations along the BN line in Gillette, Casper, and along State Highway 59 (between Douglas and Wright), which allow train interruptions to avoid highway traffic. Roads in the region are often rutted and deteriorated from extensive use of heavy, energy-related equipment. Highways 59 and 387 are being upgraded.

NOISE

Noise was calculated by using the equations discussed in "Noise Impact Analysis" (Rau and Wooten, 1980). The affected zone encompasses areas in which the Ldn (decibels weighted on a day-night basis) exceeds 55 dBA ("A" weighted decibels). The 55 dBA is a standard set by the U.S. Environmental Protection Agency as a long-term limit for protection of health and welfare. A normal conversation is equivalent to 50 to 60 decibels.

Railroads

The distances from railroad track center line to the 55 dBA contour zone

Miles City, Montana (Northern Route)	2,500 feet
Gillette, Wyoming (Central Route)	2,100 feet
Newcastle, Wyoming (Central Route)	4,000 feet
Torrington, Wyoming (Southern Route)	3,400 feet

Highways

Noise levels were calculated using the equations discussed in "Noise Impact Analysis" (Rau and Wooten, 1980). The distance to the 55 dBA contour from the road center line has been calculated for the following cities within the

Gillette, Wyoming	250 feet
Sheridan, Wyoming	1,000 feet
Ashland, Montana	100 feet
Colstrip, Montana	100 feet
Decker, Montana	800 feet

SOCIOLOGY

Social Organization

Social organization is discussed for the three communities, Ashland (Rosebud County), Broadus (Powder River County), and Gillette (Campbell County), that would be affected from any of the alternatives described in Chapter 2.

Ashland and Broadus, Montana, (see Regional Activity Map) are rural communities and have received very little population increase over the past decade. Also, Ashland is an unincorporated community. In both communities interpersonal relationships are on an informal basis. Friendship networks are dense, which means a community resident knows just about everyone else in the community.

The Northern Cheyenne and Crow Indian reservations are located in the northwestern part of region (see Regional Activity Map). Since Ashland is located adjacent to the eastern boundary of the Northern Cheyenne Reservation, most of the town's occupants are Native Americans.

Gillette, Wyoming, has grown rapidly since the 1960s which has already changed the social organization considerably. Interpersonal relationships are formal. A community resident knows relatively few others in the community, and friendship ties are made on the basis of occupation, age, and religion (Laumann, 1973; Wellman, 1979).

Community Services and Facilities

Table 3-5 shows the existing levels of community services and facilities. Water and sewage facilities are adequate to support the present population (see Water Resources). Fire protection throughout

most of the region is gained through a volunteer force.

Ashland (Rosebud County) does not currently have a public high school for non-Native Americans. Students from the area attend public school in Colstrip and Broadus.

Housing

See Table 3-6 for the existing number of dwelling units in the Powder River Region.

Attitudes

Overall, people who were interviewed within the region favored coal development. There was a higher level of unqualified support for coal development in Wyoming than Montana. Some residents stated they would be in favor only if it was certain the coal was needed to help meet the nation's energy requirements. The main reasons given for favoring coal development were the economic benefits and the need to develop domestic energy resources. Economic benefits stated pertained to increased employment and increased tax base. A common response was that the coal is needed to help reduce the amount of imported fuel. Environmental concerns expressed were regarding reclamation of the land, and water quantity and quality. Concern was also expressed regarding the impacts from the influx of population (especially in Montana). A more detailed description of attitudes within specific areas is given in the individual Tract Profiles (BLM, 1981).

ECONOMICS

Montana

Table 3-7 presents a synopsis of the existing 1980 economic environment for the Montana area of the region. Coal employment numbered 950 in Big Horn County, and 380 in Rosebud County, as reported by the Montana Employment Security Division of the Department of Labor and Industry. Actual coal employment for Powder River County is not discloseable; however, a baseline run from the Coaltown model, developed by Lloyd Bender and others at Montana State University, estimated Powder River County coal employment to be 15.

Wyoming

Table 3-8 presents a synopsis of the existing 1979 economic environment for the Wyoming area of the region. Coal employment numbered 1,672 in Campbell County, 155 in Converse County, and 302 in Sheridan County, as reported by the Wyoming Department of Economic Planning and Development (DEPAD).

TABLE 3-1
ACRES OF WILDLIFE HABITAT

Location	Acres
MONTANA	
Colstrip Area	288,000
Decker Area	256,000
Otter Creek Area	59,000
WYOMING	
Hunt Areas:	
Antelope 24 & 101	750,080
(Deer 21)	750,080
Antelope 17	1,099,520
(Deer 17 & 18)	1,758,020
Antelope 23	851,840
(Deer 19 & 20)	1,158,400

TABLE 3-2
POPULATION TRENDS
BIG GAME - CAMPBELL COUNTY, WYOMING

Antelope	1975	1976 (% change)	1977 (% change)	1978 (% change)	1979 (% change) 75-79
Area 24					
Area Harvest	1,981	2,545 (+28.5)	1,937 (-23.9)	1,893 (-2.3)	1,226 (-38.2)
Pumpkin Buttes Herd Unit Harvest	5,821	6,391 (+9.8)	5,264 (-17.6)	6,305 (+19.8)	5,915 (0)
% Area Harvest of Herd Unit	34%	39.8	36.8	30	20.7
Area 17					
Area Harvest	3,018	2,983 (-1.2)	1,716 (-43.5)	1,627 (-5.2)	1,071 (-64.5)
Powder River Herd Unit Harvest	3,849	4,044 (+5.0)	2,687 (-33.6)	2,690 (0)	2,156 (-44)
% Area Harvest of Herd Unit	78.4	73.7	63.8	60.4	49.6
Mule Deer					
Area 21					
Area Harvest	978	878 (-10.2)	736 (-16.2)	498 (-22.3)	316 (-67.7)
Black Hills Herd Unit Harvest	4,404	3,759 (-14.6)	3,003 (-20.1)	1,807 (-39.8)	1,349 (-69.4)
% Area Harvest of Herd Unit	22.2	23.4	24.5	27.6	23.4
Area 18					
Area Harvest	3,828	2,178 (-43.2)	1,876 (-13.9)	1,069 (-43.1)	749 (-80.5)
Powder River Herd Unit Harvest	9,418	8,489 (-9.9)	6,206 (-26.9)	4,790 (-22.8)	3,671 (-62.1)
% Area Harvest of Herd Unit	34.3	25.6	30.2	22.3	20.4

TABLE 3-3
AGRICULTURAL LAND USE ACRES

County	Total Acres	Cropland	Range	Irrigated	Woodland	Miscellaneous a/
Wyoming						
Campbell	3,034,614	157,490	2,676,971	4,176	31,056	11,985
Converse	2,653,284	76,794	2,351,058	53,364	15,280	21,034
Sheridan	1,598,195	124,590	1,213,733	54,448	11,129	13,580
Johnson	2,620,817	43,768	1,861,688	40,495	8,683	17,977
Natrona	3,713,764	57,320	3,023,890	37,493	3,073	26,147
Crook	1,804,338	165,176	1,193,768	8,712	150,685	16,721
Weston	1,478,109	53,828	1,311,350	6,427	83,040	16,511
Total	16,903,121	678,966	13,632,458	205,115	302,946	123,955
Montana						
Big Horn	3,214,720	286,739	2,329,017	49,275	b/	b/
Rosebud	3,223,424	182,827	2,778,398	38,838	63,890	43,869
Powder River	2,104,128	165,988	1,353,409	9,106	13,737	11,777
Total	8,542,272	635,544	6,460,824	92,219	77,627 c/	55,646 c/
REGION TOTAL	25,445,393	1,314,520	20,093,282	297,334	380,573 c/	179,601 c/

a/ Includes farm buildings, pig lots, ponds, etc.
b/ Information Withheld.
c/ Big Horn County not included.

Sources: USDA, Wyoming Crop Reporting Board, 1978.
USDA, Montana Department of Agriculture, 1978.

TABLE 3-4
EXISTING TPD AND AT-GRADE CROSSING INFORMATION

Location	Trains Per Day	At-Grade Crossings Daily Interruptions 5 mph	At-Grade Crossings Daily Interruptions 20 mph	At-Grade Crossings Car/Train Accidents a/ Per 100 Years
Miles City, MT	11	2 hrs 12 min	33 min	1
Gillette, WY	10	2 hrs	30 min	1
Newcastle, WY	24	4 hrs 48 min	1 hr 12 min	3
Torrington, WY	17	3 hrs 24 min	51 min	1 to 3

a/ Based on 1,000 vehicles daily.

Source: Trains per day information obtained from Peter Briggs, Burlington Northern (personal communication, 1981).

TABLE 3-5
EXISTING LEVELS OF COMMUNITY SERVICES AND FACILITIES

Service/Facility	Montana		Wyoming	
	Rosebud County	Powder River County	Campbell County	Natrona County
Law Enforcement (Sworn Officers)	14	4	56	124
Teachers	143	48	417	973
Physicians	3	1	20	96
Dentists	4	1	5	38
Hospital Beds	26 a/	0 b/	31 c/	282

a/ One hospital located in Forsyth.
b/ There is no hospital in Powder River County.
c/ Hospital operating at 52 percent capacity.

Sources: Powder River Comprehensive Plan (draft), 1981.
Rosebud County Plan, 1979.
Department of Economic Planning and Development.
Wyoming Department of Education, Wyoming Public Schools Fund Accounting and Reporting (1979-80).

TABLE 3-6
EXISTING NUMBER OF DWELLING UNITS a/

Montana b/	
Big Horn County	3,867
Hardin	1,360
Powder River County	1,123
Broadus	336
Rosebud County	3,787
Ashland District c/	248
Wyoming d/	
Campbell County	8,950
Gillette	4,650
Converse County	5,050
Douglas	2,210
Crook County	2,340
Moorcroft	415
Johnson County	2,960
Buffalo	1,635
Natrona County	27,200
Casper	19,400
Sheridan County	10,500
Sheridan	6,380
Weston County	2,830
Newcastle	1,420

a/ Includes mobil homes and multi-family housing.
b/ Estimate based on information from 1980 final census.
c/ Because Ashland is a small unincorporated town, census figures collected are for the surrounding district.
d/ Estimates based on the housing count from the 1980 preliminary census.

TABLE 3-7
THE EXISTING ECONOMIC ENVIRONMENT
FOR THE MONTANA COUNTIES IN 1980

	Coal a/ Production (million tons)	Total b/ Employment	c/ Population	Local Expenditure Levels d/ County ($1,000)	Schools ($1,000)	Towns ($1,000)
Big Horn County	18.5	5,583	11,088	6,109.5		
School					9,892.3	
Hardin			3,288			778.1
Powder River County	.03	1,245	2,523	3,887.5		
School					2,025.8	
Broadus			715			162.3
Rosebud County	24.8	5,021	9,965	6,392.5		
School					5,911.7	
Forsyth			2,550			1,341.0
Ashland District			569			e/

a/ Miles City District Office, Miles City, Montana.
b/ Research and Analysis Section, Employment Security Division, Department of Labor and Industry, Helena, Montana.
c/ Preliminary 1980 census.
d/ Obtained from the respective counties, schools and towns. Includes debt servicing.
e/ Ashland is an unincorporated community without a formal budget.

TABLE 3-8
THE EXISTING ECONOMIC ENVIRONMENT
FOR THE WYOMING COUNTIES IN 1979

	Coal a/ Production (million tons)	Total b/ Employment	c/ Population	Local Expenditure Levels d/ County ($1,000)	Schools ($1,000)	Towns ($1,000)
Campbell County	41.0	12,453	23,200	13,681.1	35,885.2	
School District #1 Gillette			11,500			10,122.0
Converse County	3.8	5,056	13,200	8,304.0	15,279.5	
School District #1 Douglas			5,680			6,690.0
Crook County	-0-	1,461	5,200	3,467.4	4,578.5	
School District #1 Moorcroft			1,010			384.0
Johnson County	-0-	2,099	6,600	2,062.3	5,646.8	
School District #1 Buffalo			3,700			1,902.3
Natrona County	-0-	36,293	69,600	35,668.5	30,908.8	
School District #1 Casper			49,300			41,792.5
Sheridan County	3.5	8,115	24,300	14,724.3	9,898.8	
School District #2 Sheridan			14,700			7,143.8
Weston County	-0-	2,479	7,020	3,806.8	3,671.2	
School District #1 Newcastle			3,550			1,662.8

a/ Published by the Wyoming Department of Economic Planning and Development.
b/ Published by the Wyoming Security Employment Commission.
c/ Estimate based on the 1980 population to employment ratio derived from the preliminary census from the U.S. Census Bureau. City estimates based on the 1980 town to county ratio.
d/ Obtained from the respective counties, schools and towns. Includes debt servicing.