# DRAFT

## ENVIRONMENTAL IMPACT STATEMENT FOR THE PITTSBURG AND MIDWAY COAL MINING COMPANY LAND EXCHANGE

Prepared for

**U.S. Department of the Interior**
**Bureau of Land Management**
**Casper Field Office**
**Casper, Wyoming**

and

Cooperating Agency

**U.S. Office of Surface Mining**
**Reclamation and Enforcement**
**Denver, Colorado**

by

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**Sheridan, Wyoming**

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**Abbreviations and Acronyms Used in this Report**

| | |
|---|---|
| AAQS | Ambient Air Quality Standards |
| ac-ft | acre-foot, acre-feet |
| ACEC | Area of Critical Environmental Concern |
| ANC | acid neutralizing capacity |
| ANFO | ammonium nitrate and fuel oil |
| APE | Area of Potential Effect |
| AQRV | air quality related values |
| AUM | Animal Unit Month |
| AVF | alluvial valley floor |
| BACT | best available control technology |
| bcy | bank cubic yards |
| BLM | Bureau of Land Management |
| BNSF | Burlington Northern Santa Fe |
| BOGC | Board of Oil and Gas Conservation |
| BP | before present |
| BTNF | Bridger Teton National Forest |
| Btu/lb | British thermal units per pound |
| C | Celsius |
| ca | circa |
| CAA | Clean Air Act |
| CAAA | Clean Air Act Amendments |
| CBM | coal bed methane |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| COE | U.S. Army Corps of Engineers |
| dBA, dB(A) | A-weighted decibels |
| DEIS | Draft Environmental Impact Statement |
| DFC | Desired Future Condition |
| DM&E | Dakota, Minnesota & Eastern Railroad Corporation |
| DNRC | Department of Natural Resources and Conservation |
| DOI | Department of the Interior |
| dscf | dry standard cubic foot |
| dv | deciview, a measure of view impairment |
| EA | Environmental Assessment |
| EIA/DOE | Energy Information Administration/Department of Energy |
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| F | Fahrenheit |
| FEIS | Final Environmental Impact Statement |
| FLAG | Federal Land Managers Air Quality Related Values Work Group |
| FLM | Federal Land Manager |
| FLPMA | Federal Land Policy Management Act of 1976 |
| ft/day | feet per day |
| ft | feet, foot |
| $ft^3$ | cubic feet |
| GLO | General Land Office |
| gpm | gallons per minute |
| HAP | hazardous air pollutant |

**Abbreviations and Acronyms Used in this Report**

| | |
|---|---|
| ISC3 | US EPA's Industrial Source Complex |
| Km | kilometers |
| LNCM | Lands Necessary to Conduct Mining |
| LOM | Life of Mine |
| LOP | Life of Project |
| LPI | early part of the Late Prehistoric Period |
| LPII | latter part of the Late Prehistoric Period |
| MBHFI | migratory birds of high federal interest |
| MBMG | Montana Bureau of Mines and Geology |
| MDEQ/AWM | Montana Department of Environmental Quality/Air and Waste Management Bureau |
| MDEQ | Montana Department of Environmental Quality |
| MDEQ | Montana Department of Environmental Quality |
| mg/l | milligrams per liter |
| $mi^2$ | square miles |
| MLA | Mineral Leasing Act of 1920 |
| mm | millimeter |
| MM4 | mesoscale model |
| mph | miles per hour |
| MSA | Metropolitan Statistical Area |
| MSHA | Mining Safety and Health Administration |
| NAAQS | National Ambient Air Quality Standards |
| NCDC | National Climatic Data Center |
| NEPA | National Environmental Policy Act of 1969 |
| $NO_2$ | nitrogen dioxide |
| $NO_x$ | nitrogen oxides |
| NPS | National Park Service |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NSPS | New Source Performance Standards |
| $O_3$ | photochemical oxidants |
| OSHA | Occupational Safety and Health Administration |
| OSM | Office of Surface Mining Reclamation & Enforcement |
| P.M. | Prime Meridian |
| P&M | Pittsburg & Midway Coal Mining Company |
| Pb | lead |
| PILT | Payment in Lieu of Taxes |
| $PM_{10}$ | particulates finer than 10 microns |
| $PM_{2.5}$ | particles finer than 2.5 microns |
| ppbv | parts per billion by volume |
| ppm | parts per million |
| ppmv | parts per million by volume |
| PRB | Powder River Basin |
| PRRCT | Powder River Regional Coal Team |
| PSD | prevention of significant deterioration |
| PSO | Public Services Company of Oklahoma |
| PTE | Potential-to-Emit |
| ROD | Record of Decision |
| SAR | Sodium Adsorption Ratio |
| SARA | Superfund Amendment & Reauthorization Act of 1986 |

**Abbreviations and Acronyms Used in this Report**

| | |
|---|---|
| SEO | State Engineer's Office |
| SHPO | State Historic Preservation Office |
| SMCRA | Surface Mining Control and Reclamation Act of 1977 |
| $SO_2$ | sulfur dioxide |
| T&E | threatened and endangered |
| TDS | total dissolved solids |
| tpd | tons per day |
| tpy | tons per year |
| TSP | total suspended particulates |
| U.S. | United States |
| USC | United States Code |
| USDA | U.S. Department of Agriculture |
| USDC, BC | U.S. Department of Commerce, Bureau of the Census |
| USDC | U.S. Department of Commerce |
| USDI | U.S. Department of the Interior |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| UW | University of Wyoming |
| VOC | volatile organic carbon |
| VRM | visual resource management |
| WAQSR | Wyoming Air Quality Standards and Regulations |
| WDEQ/LQD | Wyoming Department of Environmental Quality/Land Quality Division |
| WDEQ | Wyoming Department of Environmental Quality |
| WDEQ/AQD | Wyoming Department of Environmental Quality/Air Quality Division |
| WGFD | Wyoming Game and Fish Department |
| WMA | Wyoming Mining Association |
| WOGCC | Wyoming Oil and Gas Conservation Commission |
| WRCC | Western Regional Climate Center |
| WSGS | Wyoming State Geological Survey |
| $\mu g/m^3$ | micrograms per cubic meter |

## EXECUTIVE SUMMARY

On February 4, 1999, P&M[1] filed a proposal with BLM to exchange P&M-owned land and minerals in Lincoln, Carbon and Sheridan Counties in Wyoming for federally-owned coal in northern Sheridan County. P&M is a wholly owned subsidiary of Chevron Corporation. Figure ES-1 is a general location map showing all the lands that would be involved in the exchange as proposed in relation to the State of Wyoming.

P&M owns approximately 5,923 acres of surface estate and portions of the mineral estate on the lands in Lincoln, Carbon, and Sheridan Counties, Wyoming, shown in Figures ES-2, ES-3, and ES-4. They are offering to exchange their ownership in these lands for federal coal rights in Sheridan County in the tract shown in Figure ES-5.

Figure ES-2 shows the lands P&M is offering to exchange in Lincoln County, referred to here as the Bridger lands. If the exchange is completed as proposed, P&M would transfer approximately 3,086 acres of surface estate and 3,086 acres of mineral estate to U.S. ownership. Approximately 2,453 acres are situated within the BTNF and would be administered by the USFS if an exchange is completed. Approximately 633 acres are located outside the BTNF and would be administered by the BLM if an exchange is completed.

Figure ES-3 shows the lands being offered by P&M in Carbon County, referred to as the JO Ranch lands. If the exchange is completed as proposed, P&M would transfer approximately 1,236 acres of surface estate to U.S. ownership. P&M does not own the mineral estate under the JO Ranch Lands. If the exchange is completed, the surface estate of these lands would be administered by BLM, and the mineral ownership would not change.

Figure ES-4 shows the Sheridan County lands being offered by P&M, referred to as the Welch lands. If the exchange is completed as proposed, P&M would transfer approximately 1,600 acres of surface estate and 800 acres of coal estate to U.S. ownership. If the exchange is completed, the surface and coal estate of these lands would be administered by BLM and the rest of the mineral ownership would not change.

Figure ES-5 shows the federal coal tract P&M seeks to acquire by exchange for the properties described above. It includes approximately 2,045 acres of land referred to as the PSO Tract in this EIS. Figure ES-5 also shows the lands in Sheridan County where P&M owns the surface. P&M owns the surface of most, but not all, of the PSO Tract. There are 6.41 acres of public land in the tract, comprised of all of Section 15, T.58N., R.84W. The coal beneath this tract is unleased federal coal, for which BLM is the managing agency. If an exchange is completed, BLM would transfer ownership of the coal to P&M.

[1] Refer to page viii for a list of abbreviations and acronyms used in this document.

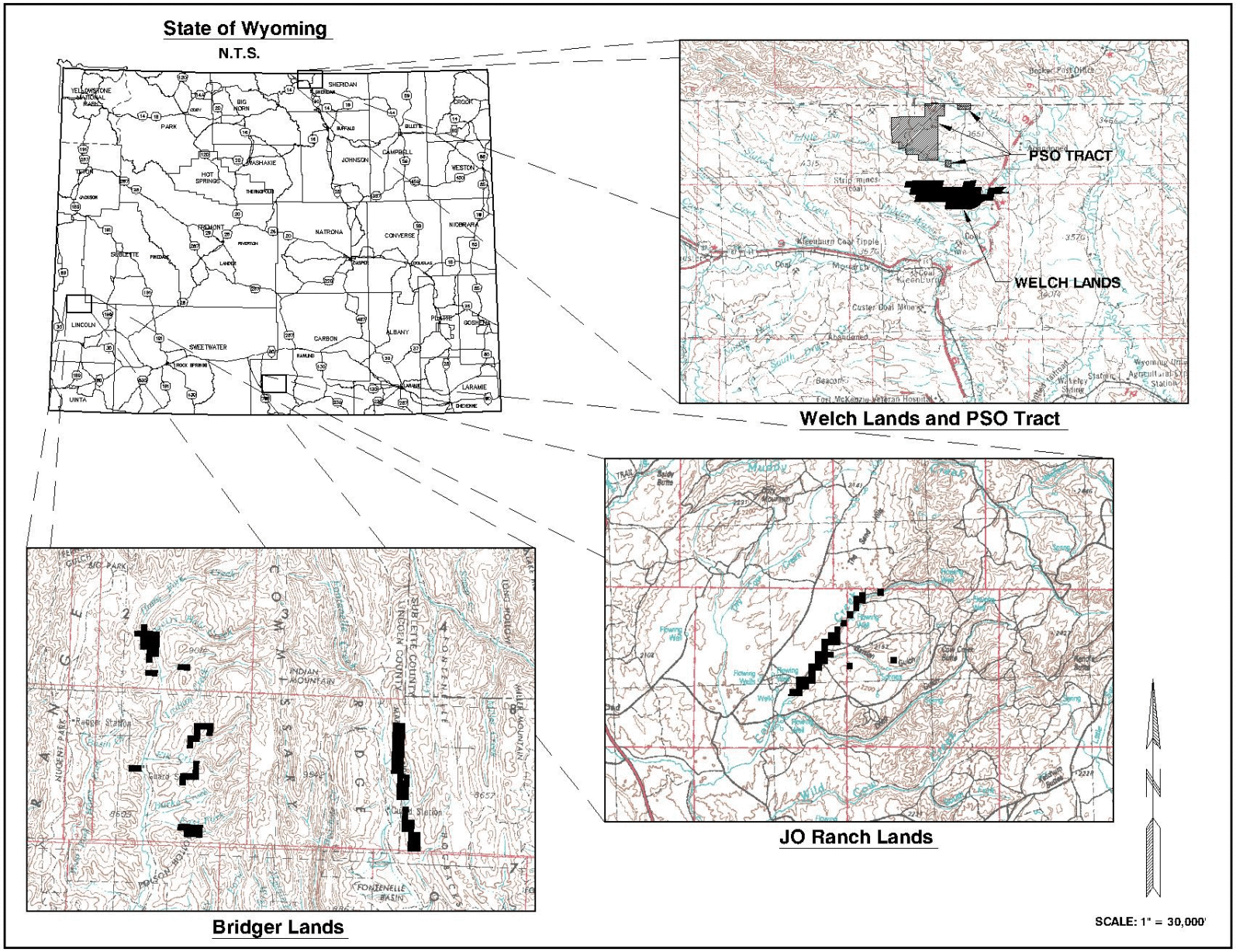



Figure ES-1. General Location Of Lands Being Offered For Exchange By P&M Coal and PSO Tract.

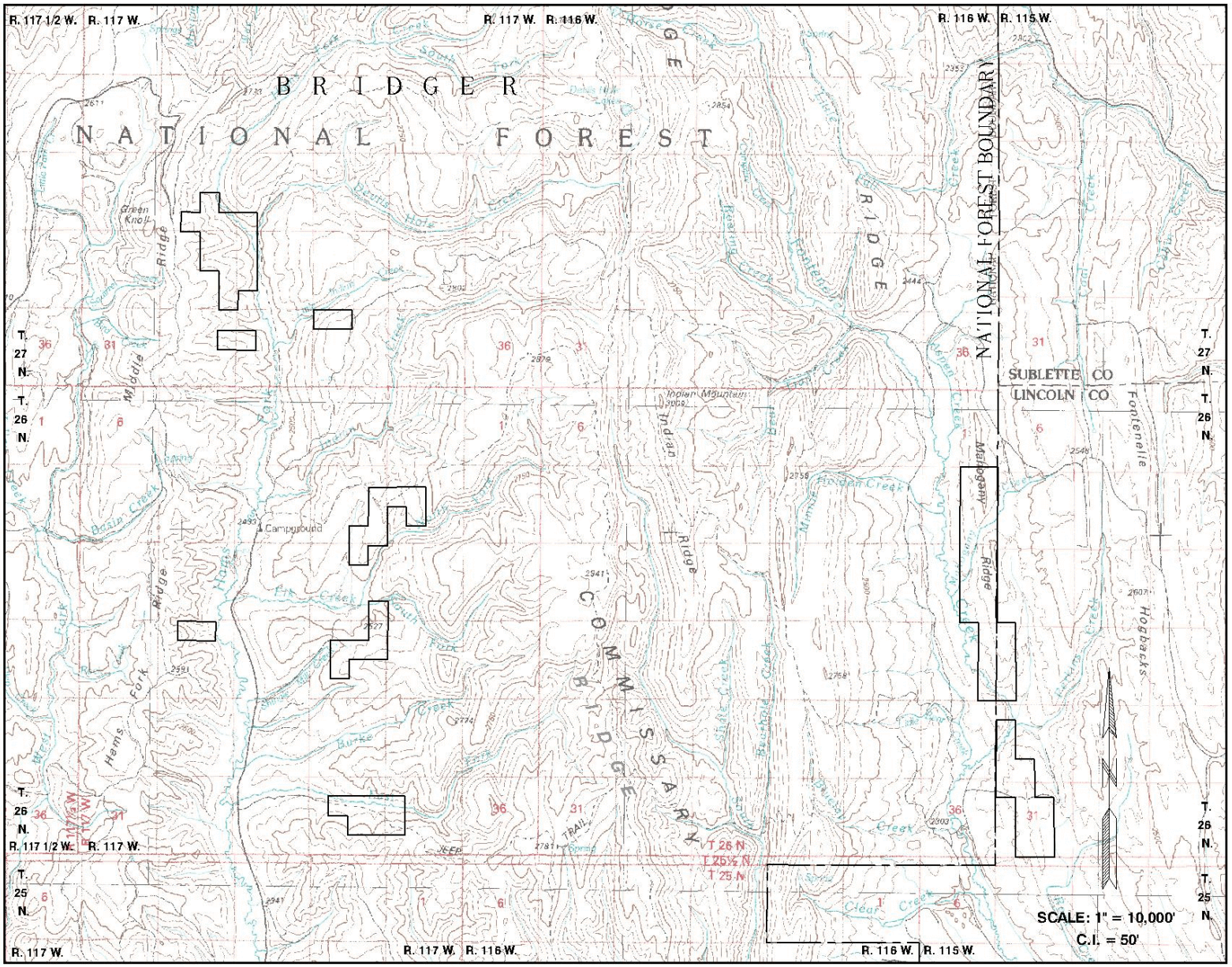



Figure ES-2. Bridger Lands Location Map.

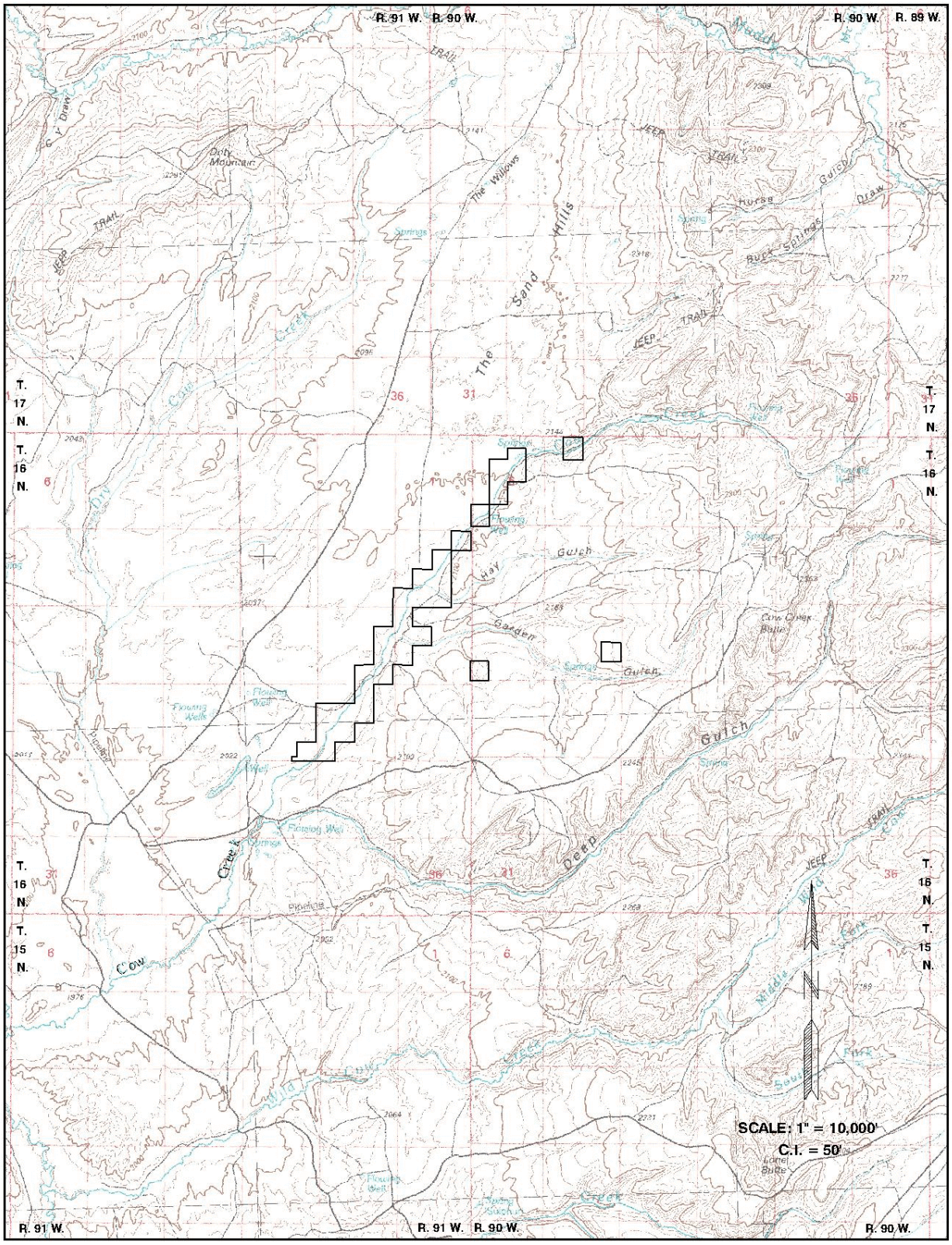



Figure ES-3. JO Ranch Lands Location Map.

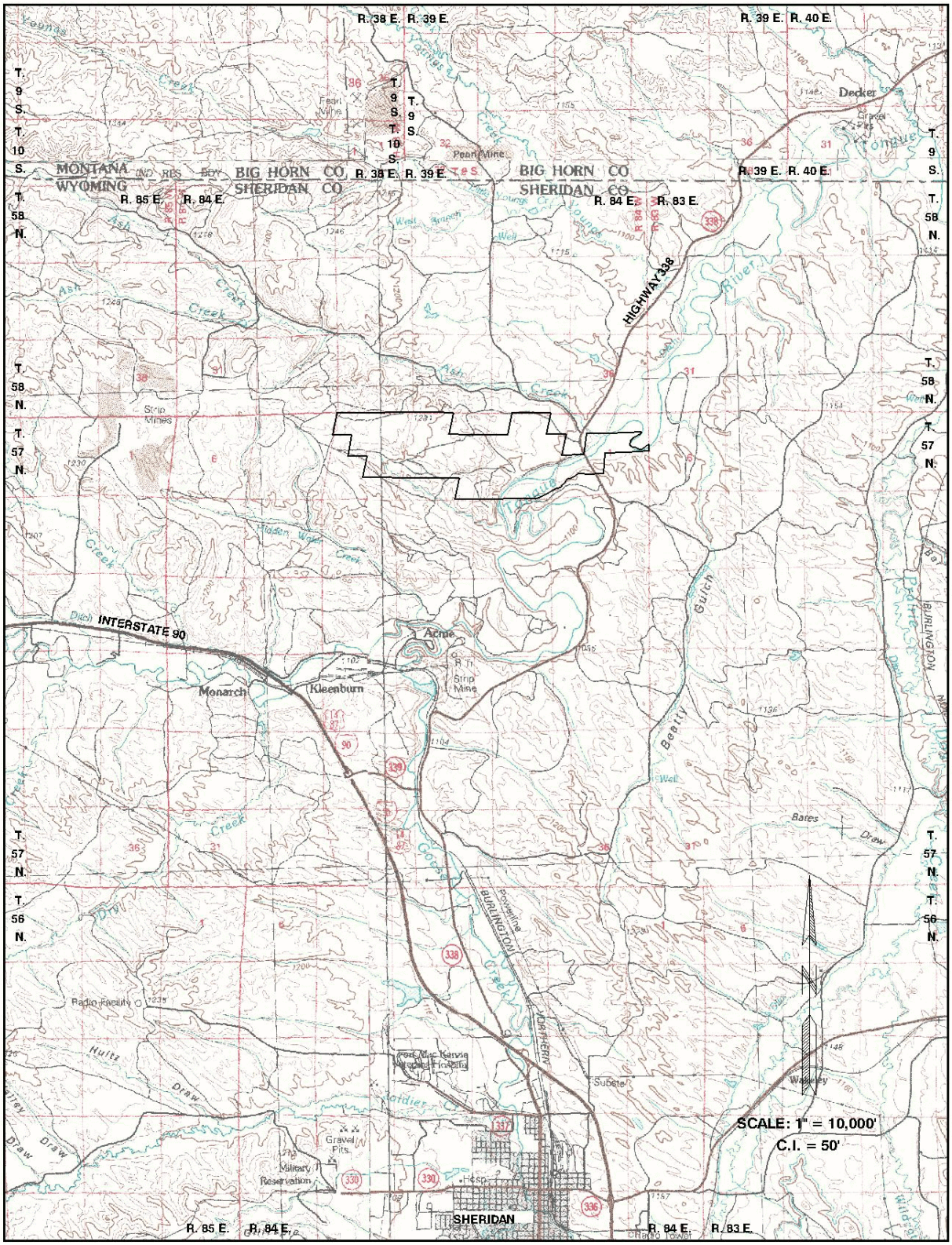



Figure ES-4. Welch Lands Location Map.

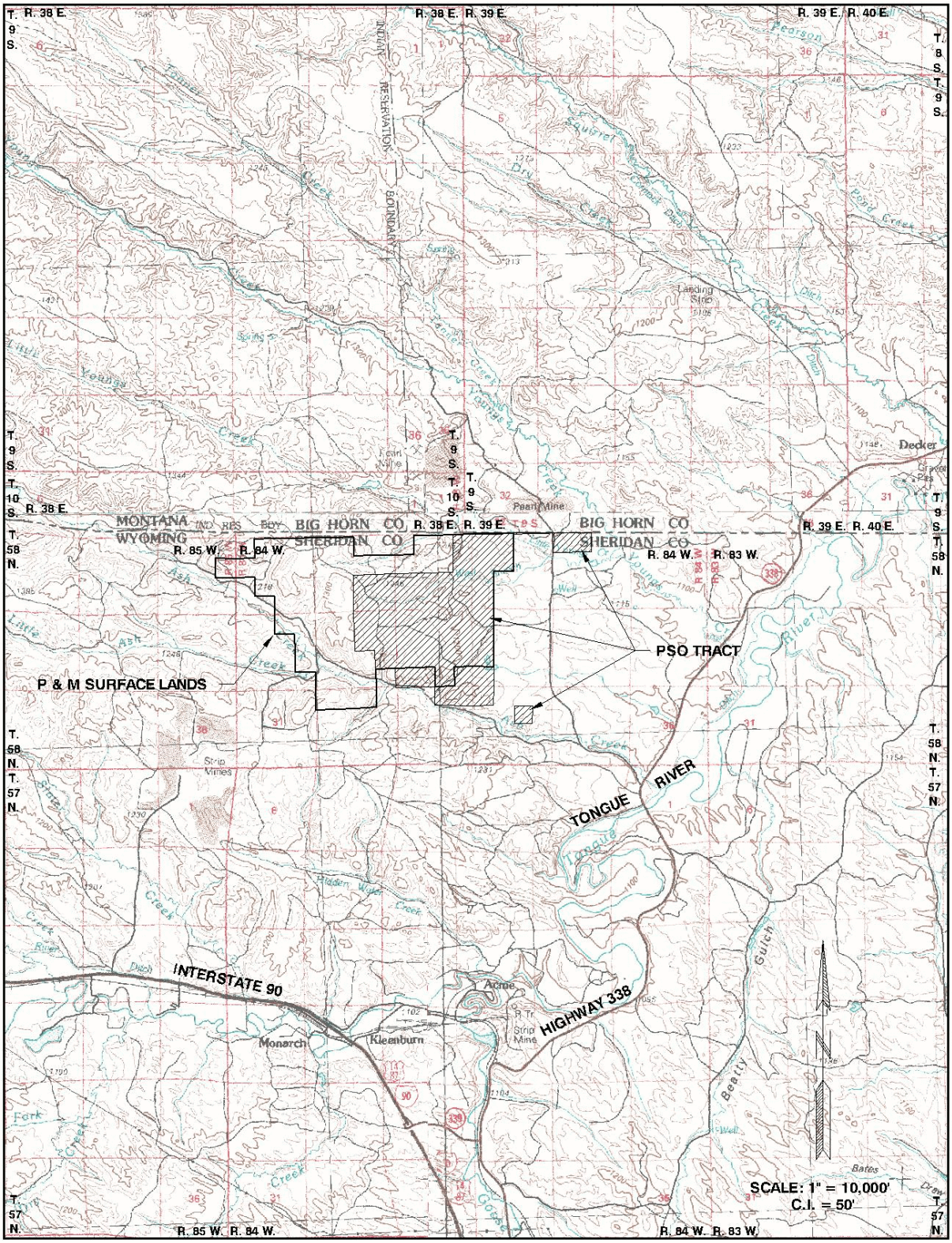



Figure ES-5. Location of P & M Surface Lands and PSO Tract.

The exchange is being processed under the provisions of the Federal Land Transaction Facilitation Act, Public Law No. 106-248, and the regulations at 43 CFR 2200. The PRRCT reviewed the exchange proposal at a public meeting held on October 27, 1999 in Gillette, Wyoming.

The two most important considerations in evaluating a land exchange proposal are (1) whether the exchange is in the public interest as required under 43 CFR 2200.0-6(b), and (2) whether the value of the interests being acquired is of equal value to the lands or interests being conveyed to private ownership (as required under 43 CFR 2200.0-6(c)).

In making the public interest determination, BLM must consider a number of factors which are outlined in the regulations at 43 CFR 2200.0-6(b).

In order to ensure that the lands or interests being exchanged are of equal value, the fair market value of the respective properties must be evaluated. In this case, the fair market value of the P&M lands will be determined through a fee appraisal by a BLM-approved qualified appraiser. BLM will determine the fair market value of the coal to be exchanged. The amount of coal that will be offered for exchange will be the amount required to equal the value of the P&M lands being acquired and will be in accordance with 43 CFR 2200.

In evaluating this exchange proposal, BLM must also fulfill the requirements of NEPA by evaluating the environmental impacts of the exchange proposal. BLM has determined that the requirements of NEPA would be best served by preparing an EIS. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of exchanging the federal coal which P&M proposes to acquire as well as to the site specific and cumulative impacts of U.S. acquisition of the lands and associated mineral resources offered for exchange by P&M. Although BLM would not authorize mining by exchanging the federal coal as proposed, the EIS considers the impacts of mining the coal proposed for exchange because that could be a consequence of completing this exchange.

BLM will use the analysis in this EIS in making a public interest determination, in accordance with 43 CFR 2200.0-6(b), on whether to exchange coal for the offered lands.

The USFS is a cooperating agency on this EIS. The Bridger lands in Lincoln County include most of the remaining parcels of private land within the Kemmerer Ranger District of the BTNF. Acquisition of these lands is a high priority for the USFS.

OSM is also a cooperating agency on this EIS. OSM has primary responsibility to administer programs that regulate surface coal mining and the surface effects of underground coal mining operations. If the

exchange is completed, the coal would no longer be federally owned, but OSM would retain some oversight responsibilities on the regulation of the proposed surface coal mine.

If the exchange is completed, P&M must complete baseline studies and obtain permit approvals prior to mining. They propose to begin mining the coal by about 2008, depending on market conditions. The mining method would be truck and shovel, and the coal would be sold for use in electric power generation.

After mining, the land would be reclaimed for livestock grazing and wildlife use, which is the current use of the PSO Tract.

There are currently no active coal mines in Sheridan County, Wyoming, although coal has been mined from both underground and surface mines in the county in the past. The Big Horn Coal Mine, which was located several miles south of the PSO Tract, was reclaimed in 2000. Two surface coal mines are currently active north of Sheridan in Montana (Decker and Spring Creek). Operations at the Decker Mine are located approximately six miles northeast of the proposed Ash Creek Mine. The Spring Creek Mine operations are located northwest of the Decker Mine.

This draft EIS analyzes two alternatives:

<u>The Proposed Action</u> is to complete an exchange. Under the Proposed Action, the Bridger, JO, and Welch lands and minerals owned by P&M would become public lands which would be administered by BLM or USFS. Table ES-1 summarizes the lands and minerals that P&M is offering for exchange under the Proposed Action.

Under the Proposed Action, in exchange for the above properties, P&M would acquire ownership of an amount of federal coal underlying the PSO Tract that would be equal in value to the properties they are offering for exchange. P&M owns the majority of the surface estate in the tract.

The Proposed Action assumes that P&M would mine the coal in the PSO Tract. Figure ES-6 is a schematic mine plan for the proposed Ash Creek Mine prepared by P&M. P&M estimates that there are 107 million tons of recoverable federal coal in the PSO Tract. As shown in Figure ES-6, P&M proposes to expand into adjacent private coal reserves during the later part of the mine life. P&M proposes to mine the coal with shovel and truck equipment similar to those commonly utilized in the industry at other PRB surface coal mines. An overland conveyor would be used to transport coal to a unit train loadout facility on the BNSF mainline due south of the operation. After the coal is removed, the mined-out area would be reclaimed in accordance with SMCRA and Wyoming State Law.

<u>Alternative 1</u> is the No Action Alternative. Under this alternative, the exchange would not be completed. If the No-Action Alternative is selected, it is assumed that the

Table ES-1. Summary Comparison of Lands and Minerals Offered for Exchange by P&M

| Tract | Proposed Action | | | No Action Alternative | |
|---|---|---|---|---|---|
| | **Surface Estate (acres)** | **Mineral Estate (All Minerals) (acres)** | **Mineral Estate (Coal Only) (acres)** | **Surface Estate (acres)** | **Mineral Estate (acres)** |
| Bridger | 3,086.25 | 3,086.25 | 0.00 | 0.00 | 0.00 |
| JO Ranch | 1,236.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| Welch | 1,600.41 | 0.00 | 800.00 | 0.00 | 0.00 |
| **TOTAL** | 5,923.13 | 3,086.25 | 800.00 | 0.00 | 0.00 |

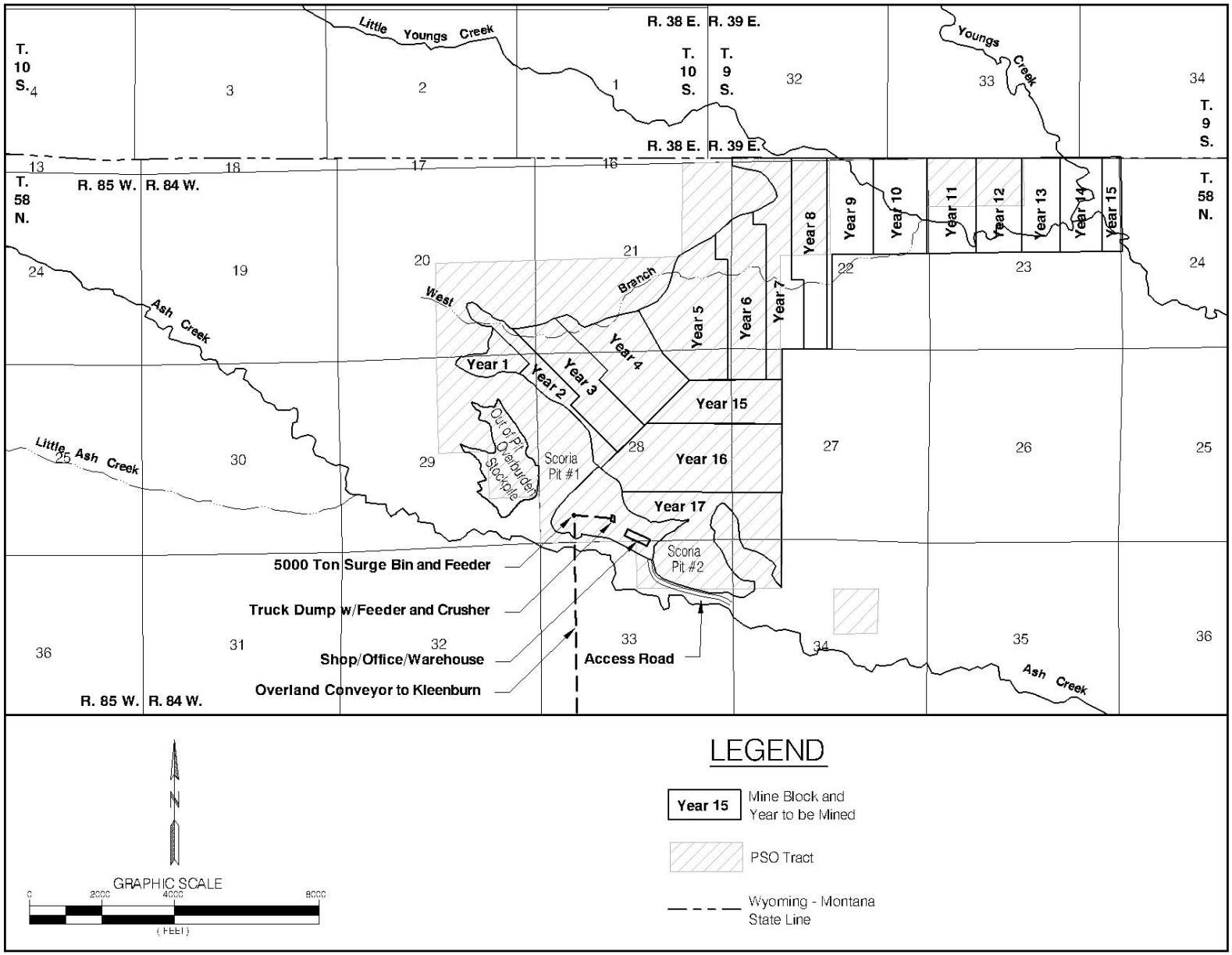



Figure ES-6. Schematic Mine Plan for the Ash Creek Mine.

federal coal in the PSO Tract would not be mined in the foreseeable future. Selection of this alternative would not preclude leasing of this federal coal in the future. Under the No-Action Alternative it is also assumed that the Bridger lands, JO Ranch lands and Welch lands would remain in private ownership. P&M has provided information suggesting that they would consider selling these lands on a competitive bid basis. These sales could result in subdivision and rural development of these lands.

Table ES-2 summarizes coal production, surface disturbance, mine life, and federal and state revenues for the Proposed Ash Creek Mine under the Proposed Action compared to the No Action Alternative (Alternative 1).

Other alternatives that were considered but not analyzed in detail assume government purchase of the offered lands from P&M. These alternatives assume that P&M would be willing to sell the offered lands for the appraised value. If they were, BLM does not have funding or a funding mechanism to acquire these lands through purchase. BLM could not lease the coal in the PSO Tract and use the revenue generated from the lease to buy the offered lands without Congressional approval. Therefore, these alternatives were not analyzed in detail.

The environmental impacts of these alternatives would be the similar to the environmental impacts of the Proposed Action or the No-Action Alternative, depending on whether or not the coal would be mined.

Critical elements of the human environment (BLM 1988) that could potentially be affected by the proposed action include air quality, cultural resources, Native American religious concerns, T&E species, hazardous or solid wastes, water quality, wetlands/riparian zones, invasive non-native species, environmental justice, and areas of critical environmental concern. Prime or unique farmlands, floodplains, wild and scenic rivers, and wilderness are not present in the project areas. The following paragraphs discuss the resources of the lands involved in the proposed exchange and the potential impacts if the exchange is completed as proposed.

<u>The Bridger Lands</u> are characterized by northerly trending ridges and valleys. Perennial and ephemeral streams which are tributaries to Hams Fork and Fontenelle Creek flow through portions of some of the lands. The Bridger lands include habitat for many species including elk, mule deer, moose, mountain lions, and black bear. The streams may be occupied by Colorado River Cutthroat trout. Threatened, endangered, candidate and proposed species that may potentially be present in this area include grizzly bear, bald eagle, Canada lynx, Ute-ladies' tresses, Kendall Warm Springs dace, ponytail chub, black-footed ferret, Colorado pikeminnow, humpback chub, razorback sucker, gray wolf, whooping crane, mountain plover, and black-tailed prairie dog

Table ES-2. Summary Comparison of Coal Production, Surface Disturbance, and Revenues for the PSO Tract

| Item | Proposed Action | No Action Alternative |
|---|---|---|
| Mineable Federal Coal | 112.5 million tons | none |
| Recoverable Federal Coal | 107.0 million tons | none |
| Area of Federal Coal Exchanged | 2,045 acres | none |
| Area of Federal Coal to be Mined | 1,244 acres | none |
| Total Area to Be Disturbed by coal mining[1] | 2,595 acres | none |
| Average Annual Coal Production | 10 million tons | none |
| Average No. of Employees | 70 | none |
| Total Projected State Revenues[2] | $ 80.25 million | none |
| Total Projected Annual Revenues to Sheridan County[3] | $ 6 million | none |

1 Includes disturbance due to mining, overburden stockpiling, construction of surface facilities, scoria mining and related disturbance.

2 Projected revenue to State of Wyoming is $0.75 per ton of coal sold and includes income from severance tax, property and production taxes, sales and use taxes, and exclude Wyoming's share of federal royalty payments (University of Wyoming 1994) (refer to Section 4.4.19 of this EIS). Figures are for PSO Tract only.

3 Based on a coal price of $8.00 per ton and production rate of 10 million tons per year, including coal from PSO Tract and adjacent privately owned coal in mine plan area. Includes counties' share of severance taxes, property taxes, sales and use taxes.

(see Appendix C for additional discussion). The tracts are suitable for or have been used for recreational purposes including hunting, fishing, camping, hiking, wildlife observation, off-road vehicle use, and photography. There is no existing mineral development on these lands.

If the exchange is completed as proposed, the Bridger lands and minerals would no longer be private inholdings surrounded by public lands. Public access to the lands would be ensured. The USFS anticipates no changes to the current management of the area. The BLM would manage the Bridger lands they acquire as they manage the surrounding public lands. The private grazing permittee would lose the existing private grazing agreement, and BLM would divide the AUMs among the 8 permittees in the La Barge Common grazing allotment.

The JO Ranch Lands are located in southwest Carbon County, Wyoming, along the valley of Cow Creek, a tributary of the Little Snake River. The northern portion of the JO Ranch lands are within the area known as the Sand Hills. The lands include crucial winter range for elk and mule deer. The portion of Cow Creek included in the exchange could include habitat for non-game BLM sensitive fish species such as roundtail chubs, flannelmouth suckers, and bluehead suckers. Threatened, endangered, candidate and proposed species that may potentially be present in this area include Ute-ladies' tresses and mountain plover (see Appendix C for additional discussion). The JO Ranch lands include ranch buildings which are eligible for National Historic Site status. The lands have been used for livestock and supplemental hay production and are suitable for or have been used for hunting, camping, hiking, rock hounding, wildlife observation, off-road vehicle use, outdoor photography, and scenic touring. Some oil and gas development has occurred in the area of the JO Ranch lands.

If the exchange is completed as proposed, the JO Ranch lands would no longer be private in-holdings surrounded by public lands. The mineral ownership of the JO Ranch lands would not change. Public access would be ensured. The BLM Rawlins Field Office would change the Great Divide Resource Management Plan, with public input, to address management of these lands. The sand hills habitat area in the northern portion of the JO Ranch lands could be added to the existing Sand Hills Area of Critical Environmental Concern. The BLM would manage the use of the historically significant JO Ranch buildings. The private grazing permittee would lose the existing private grazing agreement, but management of the grazing lands would not change because the private AUMs are currently used to calculate the carrying capacity for the BLM grazing allotments.

The Welch Lands are located in north-central Sheridan County and occupy a portion of the Tongue River valley floor and adjacent dissected

uplands. Wildlife species observed or known to frequent the area include antelope, mule deer, white-tailed deer, coyote, fox, bald eagle, mountain lion, bobcat, and elk. This portion of the Tongue River contains small-mouth bass, sauger, walleye, catfish, brown trout, and numerous non-game species. Threatened, endangered, candidate and proposed species that may potentially be present in this area include bald eagle, black-footed ferret, black-tailed prairie dog, Ute-ladies' tresses and mountain plover (see Appendix C for additional discussion). The property has historically been used principally for livestock grazing and crop production. Recreational opportunities include hunting, hiking, biking, photography. There has been no oil and gas exploration or development on these lands, but CBM development is occurring in this area. The Welch lands are underlain by coal, and there is a long history of coal mining in this area. An underground coal fire in the closed Acme Mine No. 42 was located south of and immediately adjacent to the Welch lands. The previous owners of the Welch lands had obtained a permit to mine coal in a portion of the Welch lands in 1979. They began stripping topsoil and constructed a road, but that disturbance was reclaimed in 1999.

If the exchange is completed as proposed, the Welch lands would become public lands. The BLM would also acquire 800 acres of coal estate, but the rest of the mineral ownership would not change. The BLM Buffalo Field Office would develop an amendment to their land use plan, with public input, that would address BLM management of the Welch lands. Public access would be ensured. Since the Welch lands include a portion of the Tongue River, the property has high potential for public recreation. The BLM does not plan to change the existing management of the Welch lands, which has protected the natural resources and pristine conditions.

The PSO Tract is located in the Powder River Basin (PRB), a part of the Northern Great Plains that includes most of northeastern Wyoming. The PSO Tract is located in the northwest part of the basin, several miles north of the Welch lands that P&M is offering for exchange (see Figure ES-1). In the PSO Tract, there are two mineable coal seams, referred to as the Dietz 1 and 3 seams. The Dietz 1 coal seam is present in the northern half of the tract and ranges from 5 feet to 20 feet in thickness. The Dietz 3 coal seam is present across the proposed mining area and averages 41 feet in thickness. The overburden ranges from 20 to 275 feet. The interval between the two coal seams thickens from east to west and ranges from 20 to 140 feet. Two northeast-trending structural faults outline the northwest and southeast boundaries of the proposed mining area. Based on recent drilling done by P&M, the Dietz 1 average heating value is 9,279 Btu/lb with 5.8 percent ash and 0.44 percent sulfur. The Dietz 3 average heating value is 9,352 Btu/lb with 5.4 percent ash and 0.53 percent sulfur.

The West Branch of Little Youngs Creek lies within the PSO Tract. Little Youngs Creek is a tributary to Youngs Creek, which is a tributary to the Tongue River. West Branch is an ephemeral stream and a portion of the stream may have some alluvial valley floor characteristics. Jurisdictional wetland inventories completed on the PSO Tract in 2001 identified an estimated 6.2 acres of jurisdictional wetlands on the tract.

Three big game species, pronghorn, mule deer, and white-tailed deer, occur in the vicinity of the PSO Tract. Black bear and mountain lion have been recorded in the area but are not common. Numerous raptor species have been observed on or adjacent to the tract with two species, red-tailed hawk and great horned owl, recorded as nesting on the tract. An active sage grouse strutting ground is present on the tract. Threatened, endangered, candidate and proposed species that may potentially be present in this area include bald eagle, Canada lynx, black-footed ferret, black-tailed prairie dog, Ute-ladies' tresses and mountain plover (see Appendix C for additional discussion).

The principal land use on the PSO tract is domestic grazing and wildlife habitat. Big game hunting is a principal recreational use in this area, but most of the surface of the PSO Tract is owned by P&M and P&M does not allow sport hunting on the tract. No conventional oil and gas wells have been drilled on the tract, but several CBM wells have been drilled or permitted to drill on the tract. The development of CBM in Sheridan County (Wyoming) and Big Horn County (Montana) has been affected by uncertainty due to difficulties in disposal of the produced water. There are three potential coal seams on the tract that would be expected to produce CBM. They are the Dietz 3, the Monarch, and the Carney.

If the exchange is completed as proposed and the PSO Tract is mined, the existing topography on the PSO Tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits.

Following reclamation, the average surface elevation would be lower due to removal of the coal. The reclaimed land surface would approximate premining contours and the basic drainage network would be retained, but the reclaimed surface would contain fewer, gentler topographic features. This could contribute to reduced habitat diversity and wildlife carrying capacity on the reclaimed PSO Tract. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

The geology from the base of the lowest coal proposed for mining to the land surface would be subject to considerable long-term change on the PSO Tract under the Proposed Action. The replaced overburden would be a relatively homogeneous mixture

compared to the premining layered overburden.

Development of other minerals potentially present on the PSO Tract could not occur during mining, but could occur after mining. There are no conventional oil and gas wells on the tract. CBM resources associated with the Dietz 3 coal seam that are not recovered prior to mining would be vented to the atmosphere and irretrievably lost when the coal is removed. CBM in the Monarch and Carney seams that is not recovered prior to mining would not be lost from mining activities, but could be drained by CBM wells located on lands adjacent to the PSO Tract.

Consequences to soil resources from mining the PSO Tract would include changes in the physical, biological, and chemical properties. Following reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, microbial populations, and chemical composition. The replaced topsoil would be much more uniform in type, thickness, and texture. It would be adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Moderately adverse short-term impacts to air quality would occur during the time the PSO Tract is mined if the exchange is completed and a mine is opened. Total suspended particulate (TSP) concentrations would be elevated in the vicinity of mining operations on the tract, but would not violate federal or Wyoming primary and secondary standards outside the mine's permit boundary. Dust may be visible to the public from State Highway 338. Concentrations of gaseous emissions would remain within acceptable federal and state standards.

Changes in runoff characteristics and sediment discharges would occur during mining of the PSO tract, and erosion rates could reach high values on the disturbed areas because of vegetation removal. However, state and federal regulations require that surface runoff from mined lands be treated to meet effluent standards, so sediment would be deposited in ponds or other sediment-control devices. After mining and reclamation are complete, surface water flow, quality, and sediment discharge would approximate premining conditions.

Mining the PSO Tract would cause lowered water levels in the coal and overburden aquifers, and the existing coal and overburden aquifers would be replaced by mine backfill. The faults bounding the mine area on the northwest and southeast are barriers to groundwater flow in those directions, and the Dietz 1 and Dietz 3 coal seams are absent to the southwest due to erosion and burning. Therefore, drawdown in the coal aquifers would be expected to extend only to the northeast for any appreciable distance from the mine. The predicted drawdown over the life of the mine is shown in Figure ES-7. Total dissolved solids levels in the backfill would initially be expected to

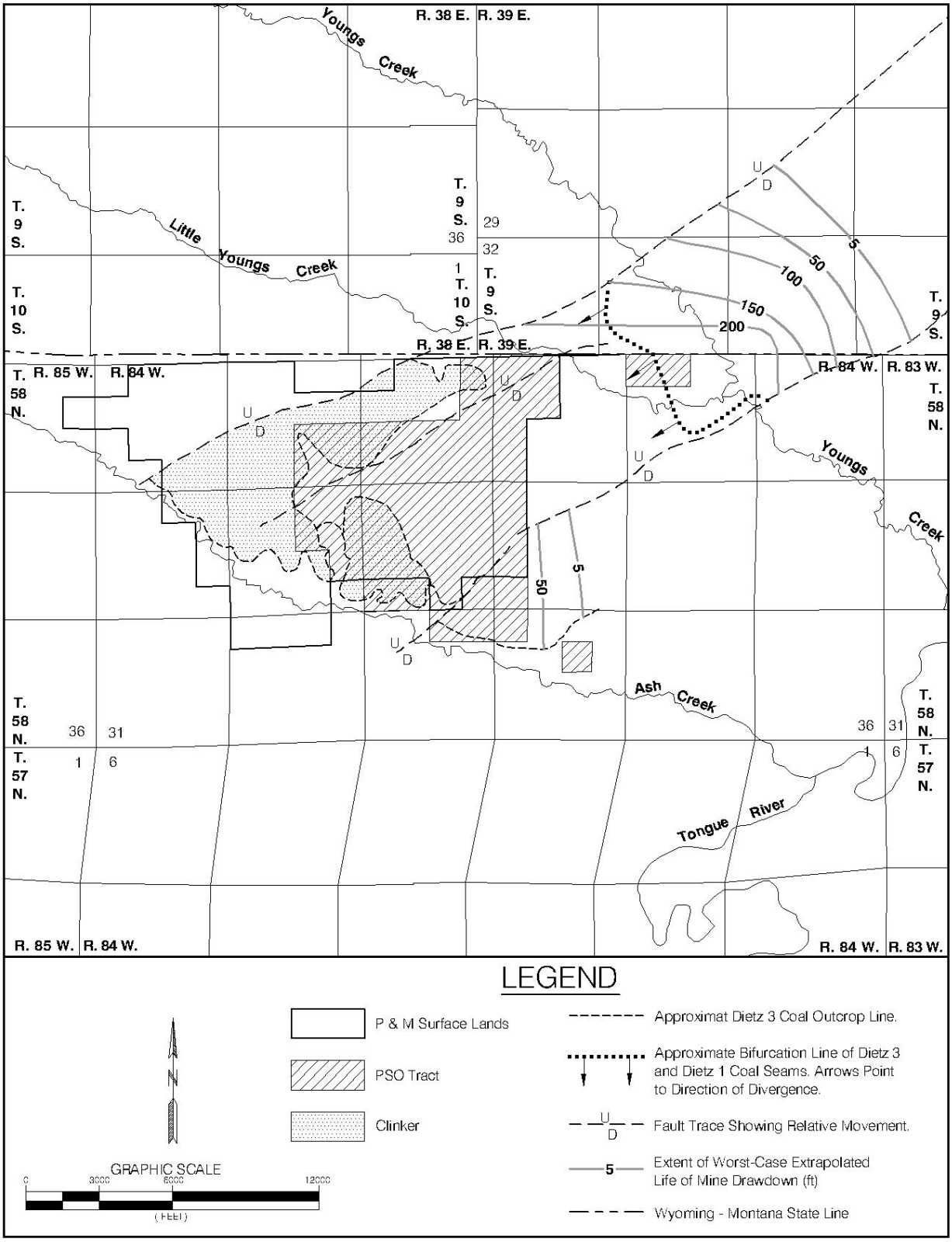



Figure ES-7. Life of Mine Drawdown Map, Resulting from Proposed Action.

be higher than in the pre-mining aquifers, but would be expected to meet the pre-mining Wyoming Class III standards for use as stock water. The data available on hydraulic conductivity suggest that wells completed in the backfill would provide yields greater than or equal to pre-mining coal wells.

Based on preliminary alluvial valley floor determinations, it is likely that portions of West Branch in the PSO Tract would have alluvial valley floor characteristics. Impacts to designated jurisdictional alluvial valley floors are not permitted if they are determined to be significant to agriculture. Alluvial valley floors that are not significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process.

There are 6.2 acres of jurisdictional wetlands on the PSO Tract. Jurisdictional wetlands that are disturbed by mining must be replaced during the reclamation process.

Mining would progressively remove the native vegetation on the PSO Tract. Reclamation and revegetation of this land would occur contemporaneously with mining. Re-established vegetation would be dominated by species mandated in the reclamation seed mixtures, which are approved by the WDEQ. The majority of these species would be native to the PSO Tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. Estimates for the time it would take to restore sagebrush to premining density levels range from 20 to 100 years. An indirect impact associated with this vegetative change would potentially be a decreased big game habitat carrying capacity. However, a diverse, productive, and permanent vegetative cover would be established on the PSO Tract within about 10 years following reclamation, prior to release of the final reclamation bond. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land uses (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. The reclamation plans for the PSO Tract would also include steps to control invasion by weedy (invasive, nonnative) plant species. Most of the surface of the PSO Tract is privately owned, and the private landowners would have the right to manipulate the vegetation on their lands as they desire once the final reclamation bond is released.

In the short term, wildlife would be displaced from the PSO Tract in areas of active mining and the acreage of habitat available for wildlife populations would be reduced. However, the PSO Tract does not contain any unique or crucial big game habitat, and habitat would be disturbed in parcels, with reclamation progressing as new disturbance occurs. In the long term, following reclamation, carrying capacity and habitat diversity may be reduced due to flatter topography, less diverse

vegetative cover and reduction in sagebrush density.

T&E wildlife surveys specific to the PSO Tract were conducted 2000 and 2001. No potential habitat was found on the tract for the Canada lynx. Bald eagles nest along the Tongue River several miles east of the tract and have been observed foraging on the tract. Black-footed ferret, mountain plover, and Ute ladies'-tresses have not been documented on the tract during the surveys that have been conducted. There are several prairie dog colonies on the tract that would be affected by mining. (See Appendix C for additional discussion.)

Active mining would preclude other land uses. Recreational use of the PSO Tract would be severely limited during mining, however, there is little public surface included in the tract. The main private landowner is P&M, who does not allow sport hunting on the PSO Tract. Within 10 years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels. The cumulative impacts of energy development (coal mining, oil and gas) in the PRB are and will continue to contribute to a reduction in hunting opportunities for some animals (pronghorn, mule deer, and sage grouse).

Mining would also impact oil and gas development on the tract during active mining. The federal oil and gas rights are leased. There are no active conventional oil and gas wells on the tract. CBM wells have been drilled but production has been delayed due to water disposal issues. Existing active wells would have to be plugged and abandoned and all associated production equipment would have to be removed prior to mining. New drilling would not be possible in areas of active mining, but could potentially take place in areas not being mined, or in reclaimed areas. CBM that is not recovered from the coal being mined (Dietz 3 coal seam) prior to mining would be vented and irretrievably lost as the coal is removed. CBM that is not recovered from coal seams beneath the coal being mined (Monarch and Carney coal seams) would not be directly affected by coal mining, but CBM in those zones could be drained by wells located adjacent to the mining activities.

Cultural resources on the PSO Tract would be impacted by mining, but adverse impacts would be mitigated through data recovery and/or avoidance of significant properties. Formal Wyoming State Historic Preservation Office (SHPO) consultation is required for concurrence with determination of the eligibility of sites for inclusion on the National Register of Historic Places (NRHP) prior to mining. The eligible cultural properties on the PSO Tract which cannot be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation, or data recovery program is developed in consultation with the SHPO.

No sites of Native American religious or cultural importance have been identified on the PSO Tract. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

No unique or significant paleontological resources have been identified on the PSO Tract, and the likelihood of encountering significant paleontological resources is small.

Mining activities on the PSO Tract would be visible from Wyoming State Highway 338. An overland conveyor proposed for transporting coal to the railroad loadout facility would be visible where the conveyor crests over hilltops. Mining would primarily affect private landscapes classified by BLM as visual resource management (VRM) Class II, and the landscape character would not be significantly changed following reclamation. No unique visual resources have been identified on or near the PSO Tract.

Impacts from noise generated by mining activities on the PSO Tract are not expected to be significant. The nearest occupied dwelling is approximately 1,300 feet from the PSO Tract. At that distance, the noise associated with blasting and mining would be below adverse levels.

The only new transportation facilities would be the overland conveyor and coal loadout facilities proposed south of the PSO Tract. Any active pipelines and utility lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their removal or relocation.

There would be no royalty or bonus payments for the coal for the federal or state government if the exchange is completed. At a production rate of 10 million tons per year and a sale price of $8.00 per ton, the value of annual production at the Ash Creek Mine would be about $80 million. The mine would employ about 70 people. Sheridan County would see an increase in assessed valuation, property tax revenues, and sales and use tax revenue. The state would realize revenues from severance taxes.

Lincoln, Carbon and Sheridan Counties would see a decrease in property tax revenues from the Bridger, JO Ranch, and Welch lands if the exchange is completed. These decreases would be partially offset by increases in Payments in Lieu of Taxes (PILT) and 25 Percent funds.

With regard to Environmental Justice issues, it was determined that potentially adverse impacts do not disproportionately affect minorities, low-income groups or Native American tribes or groups. No tribal lands or Native American communities are included in this area. The northwest corner of the PSO Tract lies close to the southeast corner of the Crow Indian Reservation.

Under the No Action Alternative, the Bridger, JO Ranch, and Welch lands would remain in private ownership, and could be developed by the private

landowner. The impacts described in the preceding paragraphs to topography and physiology, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would not occur on the PSO Tract.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, BLM can include additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. BLM has not identified additional special stipulations that should be added to the BLM lease or areas where additional or increased monitoring measures are recommended.

One issue of current concern in the area of existing coal mining in Campbell and Converse Counties, Wyoming is the release of $NO_x$ from blasting and the resulting formation of low-lying orange clouds that can be carried outside the mine permit areas by wind. As a result of this concern, industry has conducted monitoring studies of the contents of the gaseous clouds and has cooperated in research on blasting agents and blasting size aimed at reducing emissions during blasting. WDEQ has required some mines to take steps designed to mitigate the effect of the gaseous emissions during blasting.

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Other projects that are in progress or planned in the Wyoming PRB include current and proposed CBM development; federal coal leasing in Campbell and Converse counties; construction and operation of the North American Power Group's Two Elk and Two Elk Unit 2 Power Plants east of the Black Thunder Mine; construction of Wygen #1 power plant to be located at the Black Hills Corporation energy complex near Gillette, Wyoming; construction and operation by North American Power Group of a 500-megawatt coal fired power plant at the Cordero Rojo Complex; and construction and use of the proposed DM&E rail line across portions of Campbell, Converse, Niobrara, and Weston counties. With the exception of CBM development, the impacts of completing and operating these projects would not be expected to overlap with the impacts of mining the PSO Tract because the other proposed projects would all be located in the eastern PRB.

Cumulative mineral development in Sheridan County, Wyoming was evaluated in two previously prepared regional EISs. They are:

*Final Environmental Impact Statement, Powder River Coal Region*, BLM, December 1981;

*Draft Environmental Impact Statement, Round II Coal Lease Sale, Powder River Region*, BLM, January 1984.

These regional EISs projected development levels for coal, oil and gas and other minerals in the PRB in 1990 and 1995. In general, the current actual mineral development levels are at or below the levels predicted in the regional EISs for 1990 and 1995. The 1981 EIS estimated that mines in the Sheridan area (Big Horn, Decker, and Spring Creek) would produce 23.7 million tons of coal per year in 1990 and 1995. Actual 1999 production from those mines was 22 million tons. The levels of production of natural gas are higher than projected in the regional EISs because CBM production levels were not anticipated in the 1990 and 1995 regional EISs.

At this time, the development of CBM in the Tongue River drainage has been delayed by issues related to the quality of the produced water and whether that water should be discharged on the surface. If and when this issue is resolved, the rate of CBM development is likely to increase in the general area of the PSO Tract. Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality and wildlife are likely to occur.

The existing and proposed development in the PRB has and will continue to result in the introduction of additional roads, railroads, power lines, fences, mine structures, and oil and gas production equipment.

A PRB air quality impact assessment was prepared as part of the PRB Oil and Gas Project EIS under the direction of the BLM. This analysis was prepared to analyze the potential air quality impacts of the proposed CBM development in the Powder River Basin as well as other reasonably foreseeable emission sources in the basin. Coal mining is included as one of the other reasonably foreseeable emission sources. Coal mining data supplied by BLM for the analysis included estimated coal production volume (based on coal demand forecasts), annual acreage disturbance, and approximate location of mining activity for active mines in Wyoming and Montana during the years of estimated maximum cumulative activity in the basin.

Potential $NO_x$ and $SO_2$ emissions were analyzed in the PRB air quality impact assessment to predict potential impacts at 16 PSD Class I areas located in Wyoming, Montana, North and South Dakota (Argonne 2001). Based on the analysis, all potential direct cumulative $NO_2$ and $SO_2$ impacts would be at or below applicable PSD Class I increments. Potential impacts to sensitive lakes identified in the study would be below applicable significance threshholds from the identified emission sources. Visibility impacts were generally predicted to be below assumed threshold limits.

There are no predicted cumulative overlapping groundwater impacts related to mining operations in this area if the exchange is completed and the PSO Tract is mined. There is potential for overlapping groundwater impacts from mining the PSO Tract and CBM development in adjacent areas, which could increase the time required for water-level recovery to occur after the CBM and mining projects are completed. Following mining and reclamation, groundwater quality would be expected to be similar to pre-mining quality and to meet Wyoming Class III standards for use as stock water.

Wildlife habitat quality has declined in the PRB due to a continuing trend of landscape fragmentation from roads, rail lines, oil and gas wells, coal mines, and fences. Mining of the PSO Tract would add to this habitat fragmentation. Wildlife monitoring indicates that wildlife are using reclaimed areas in other areas of the PRB.

This EIS presents the BLM's analysis of environmental impacts under authority of the NEPA and associated rules and guidelines. The BLM will use this analysis in making a public interest determination on whether to exchange coal for the offered lands. If the exchange is completed and P&M acquires the federal coal in the PSO Tract, the tract cannot be mined until after a detailed surface mining and reclamation plan is submitted to and approved by WDEQ.

## 1.0 INTRODUCTION

On February 4, 1999, P&M[2] filed a proposal with BLM to exchange P&M-owned land and minerals in Lincoln, Carbon and Sheridan Counties in Wyoming for federally-owned coal in northern Sheridan County. P&M is a wholly owned subsidiary of Chevron Corporation. Figure 1-1 is a general location map showing all the lands that would be involved in the exchange as proposed in relation to the State of Wyoming.

P&M owns approximately 5,923 acres of surface estate and portions of the mineral estate on the lands shown in Figures 1-2, 1-3, and 1-4, which they are offering to exchange for the federal coal rights in the tract shown in Figure 1-5.

Figure 1-2 shows the lands in Lincoln County, referred to here as the Bridger lands. If the exchange is completed as proposed, P&M would transfer approximately 3,086 acres of surface estate and 3,086 acres of mineral estate to U.S. ownership. Approximately 2,453 acres are situated within the BTNF and would be administered by the USFS if an exchange is completed. Approximately 633 acres are located outside the BTNF and would be administered by the BLM if an exchange is completed.

Figure 1-3 shows the lands being offered by P&M in Carbon County, referred to as the JO Ranch lands. If the exchange is completed as proposed, P&M would transfer approximately 1,236 acres of surface estate to U.S. ownership. The U.S. owns the coal rights on approximately 154 acres and all mineral rights on approximately 42.5 acres included in the JO Ranch lands. The remainder of the mineral estate underlying these lands, which P&M does not own, is and would remain in private ownership. The JO Ranch lands proposed for exchange are surrounded by public lands administered by BLM. If the exchange is completed, the surface estate of these lands would be administered by BLM.

Figure 1-4 shows the Sheridan County lands being offered by P&M, referred to as the Welch lands. If the exchange is completed as proposed, P&M would transfer approximately 1,600 acres of surface estate and 800 acres of coal estate to U.S. ownership. The remainder of the coal estate is already owned by the U.S. P&M does not have ownership of the rest of the mineral estate, including the oil and gas estate. All of the non-coal mineral estate underlying the Welch lands is and would remain in private ownership. The lands surrounding the Welch lands are private lands. If the exchange is completed, the surface and coal estate of these lands would be administered by BLM.

Figure 1-5 shows the federal coal tract P&M seeks to acquire by exchange for the properties described above. It includes approximately 2,045 acres of land referred to as the PSO Tract in this EIS. Figure 1-5

[2] Refer to page viii for a list of abbreviations and acronyms used in this document.

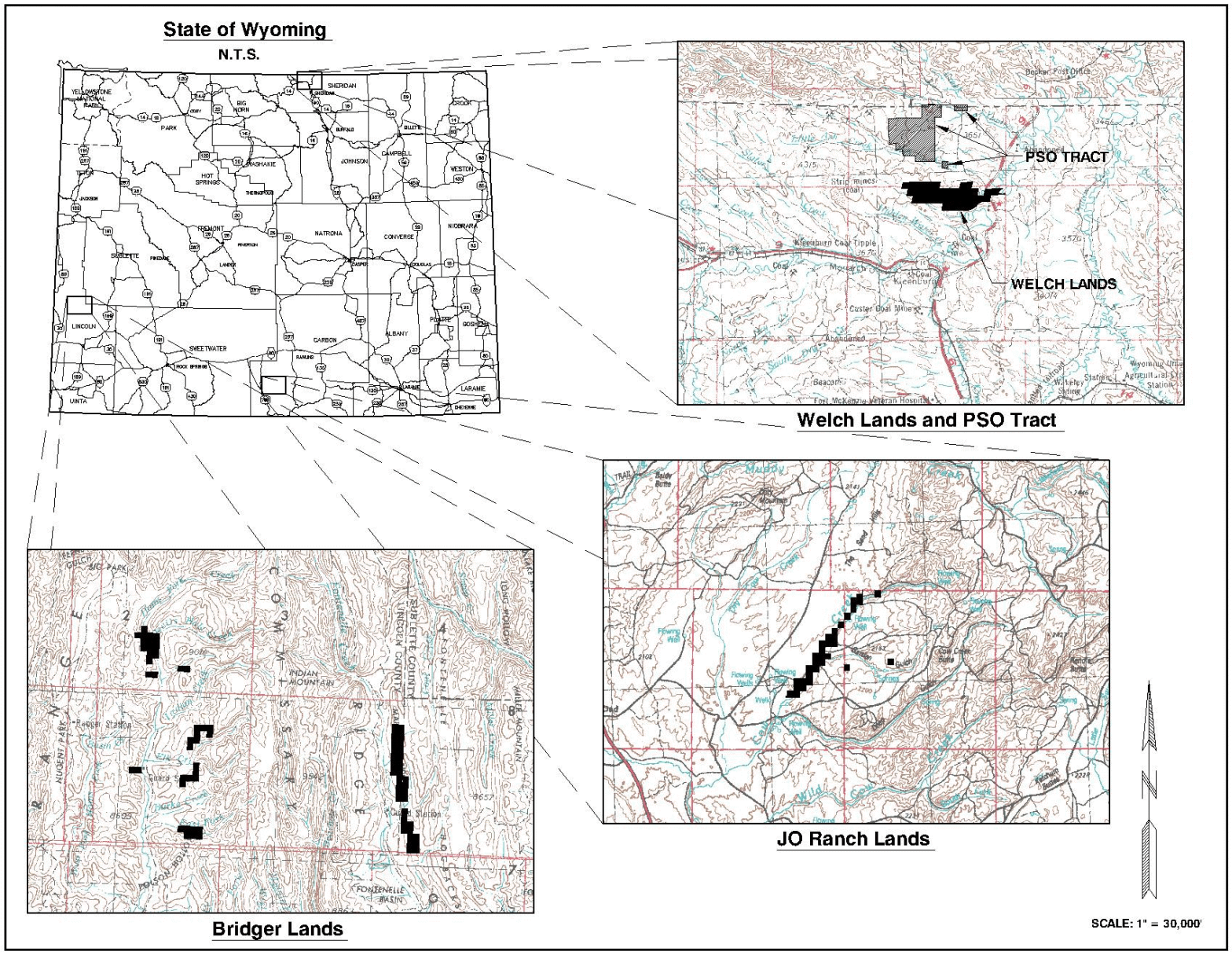
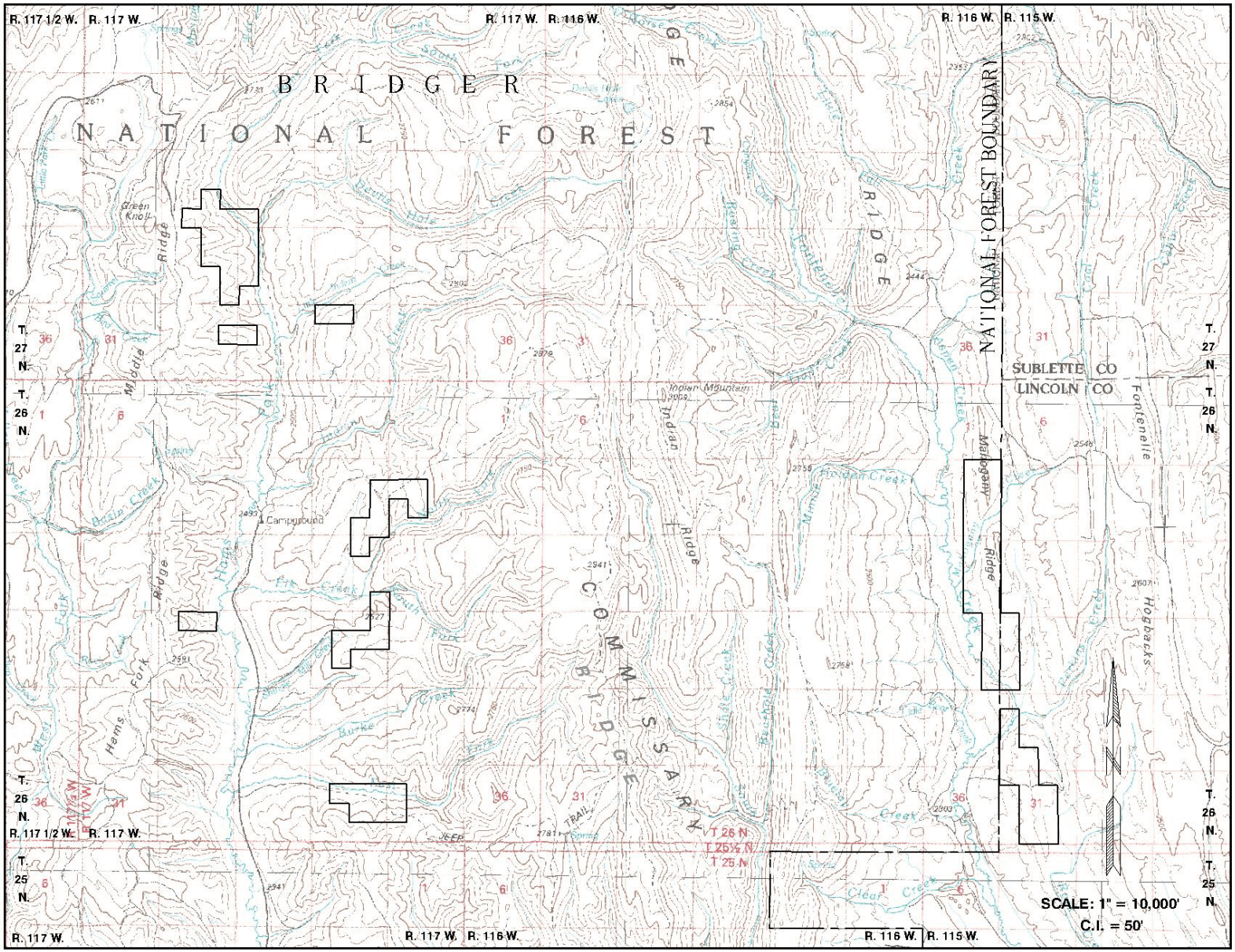



Figure 1-1. General Location Of Lands Being Offered For Exchange By P&M Coal and PSO Tract.


BRIDGER
NATIONAL FOREST
NATIONAL FOREST BOUNDARY
SUBLETTE CO
LINCOLN CO
COMMISSARY RIDGE
Indian Ridge
Middle Ridge
Hams Fork Ridge
Green Knoll
Campground
Indian Mountain
Fontenelle
Hogbacks
Burke Creek
Clear Creek
Fire Creek
Hams Fork
Middle Fork
Indian Creek
Mountain Creek
Beaver Creek
Fontenelle Creek
Cow Creek
Hogback Creek
Dairy Creek
Dams Hole
Horse Creek
Bear Creek
Bacon Creek
Little Creek
Big Creek
Cottonwood Creek
Sawmill Creek
Sawmill Fork
Little Fork
Middle Fork
Hams Fork
Fire Creek
Burke Creek
Clear Creek

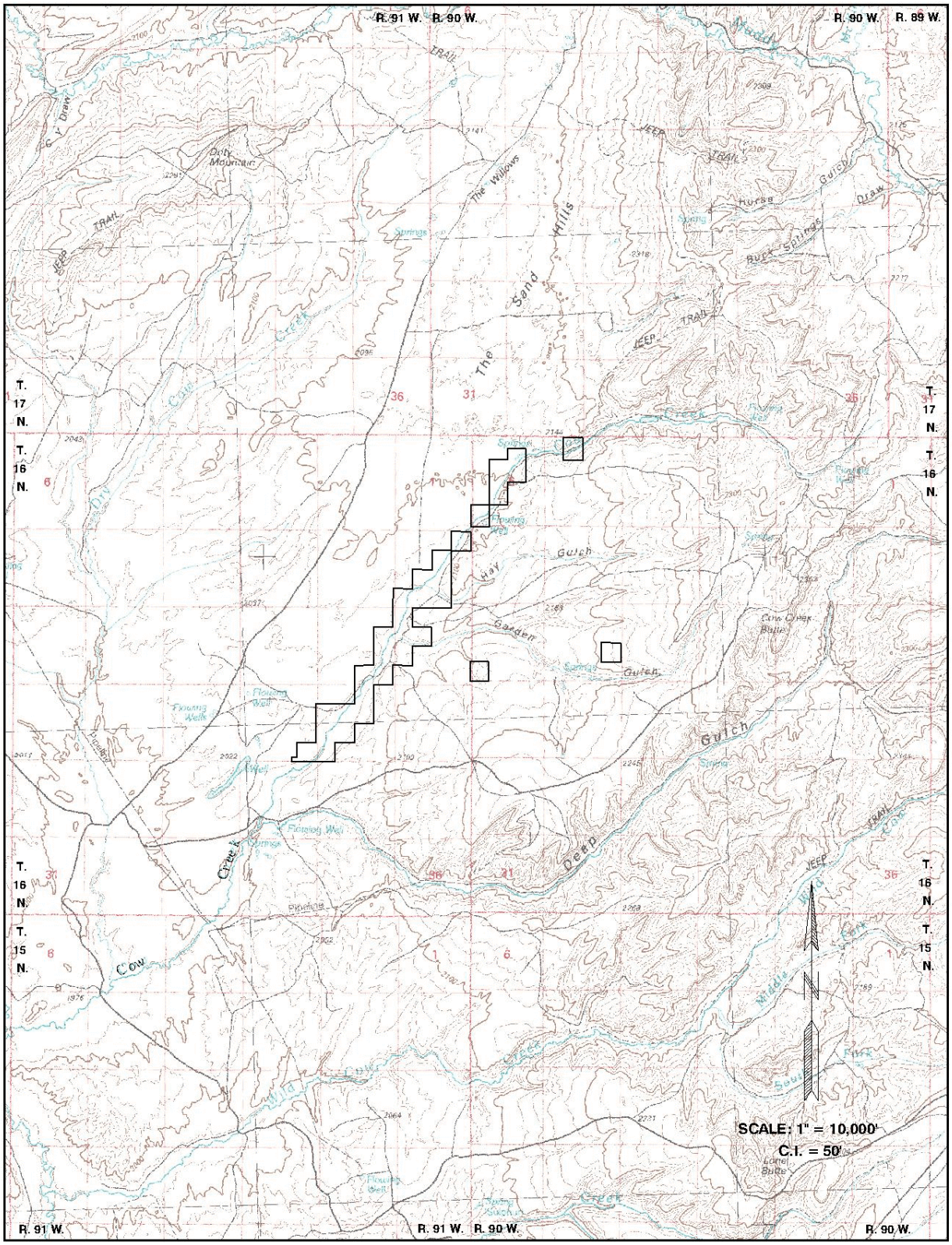



Figure 1-3. JO Ranch Lands Location Map.

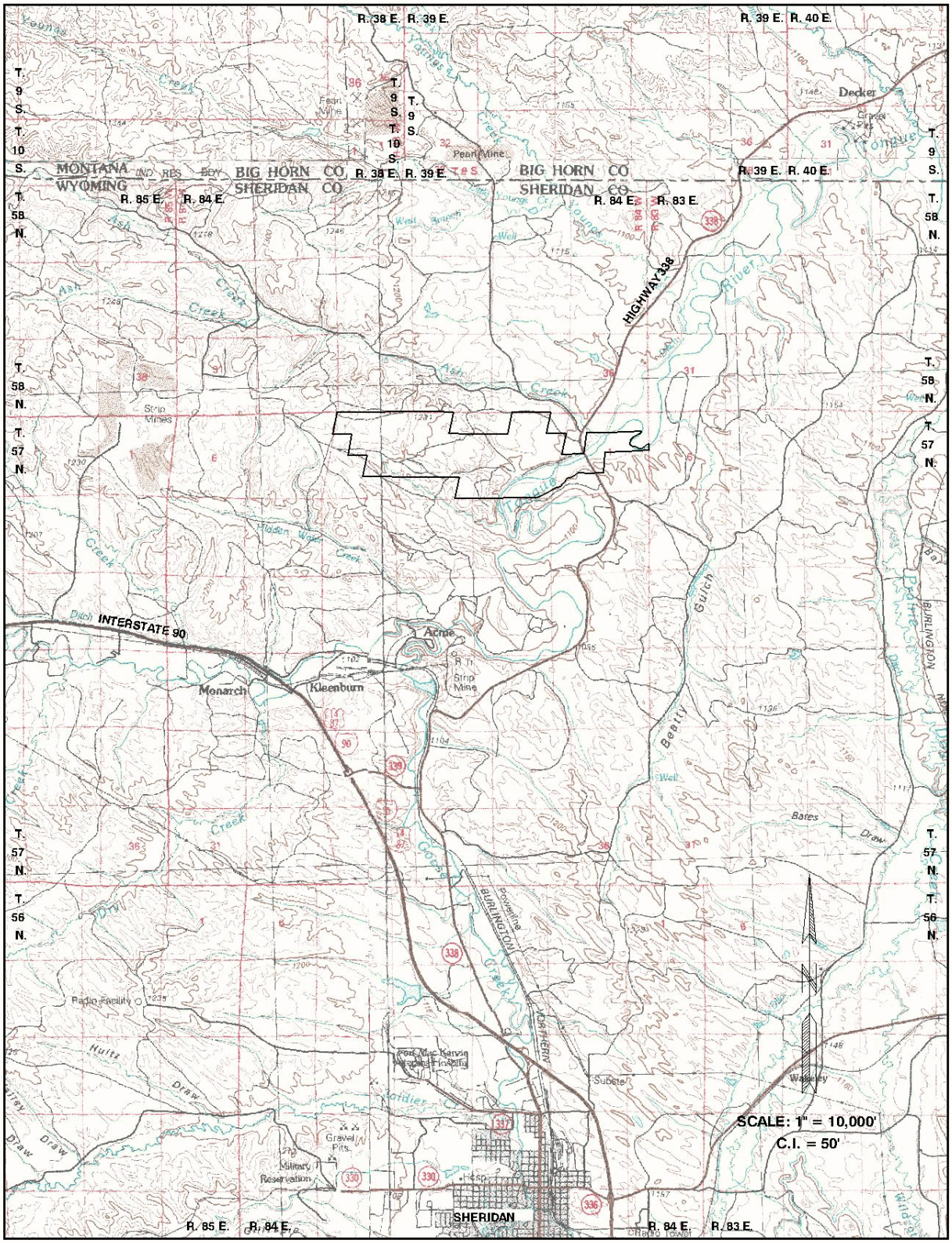



Figure 1-4. Welch Lands Location Map.

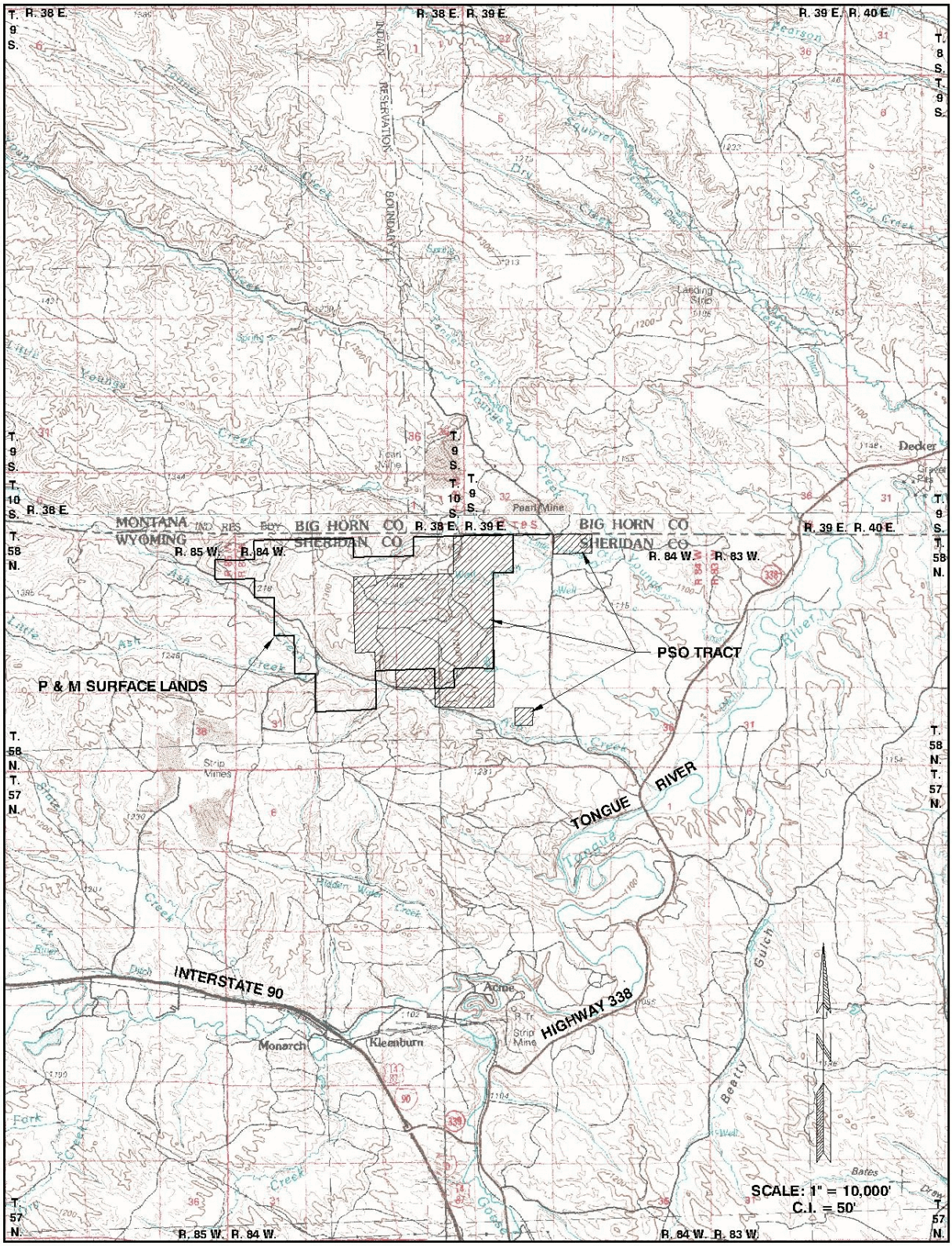



Figure 1-5. Location of P & M Surface Lands and PSO Tract.

also shows the lands in Sheridan County where P&M owns the surface. P&M owns the surface of most, but not all, of the PSO Tract. There are 6.41 acres of public land in the tract, comprised on all of Section 15, T.58N., R. 84W. The coal beneath this tract is unleased federal coal, for which BLM is the managing agency. If an exchange is completed, BLM would transfer ownership of the coal to P&M.

The exchange is being processed under the provisions of the Federal Land Transaction Facilitation Act, Public Law No. 106-248, and the regulations at 43 CFR 2200. The PRRCT reviewed the exchange proposal at a public meeting held on October 27, 1999 in Gillette, Wyoming.

Land exchanges, which are discretionary, are important tools used to consolidate land ownership patterns while bringing important resources into public ownership. The two most important considerations in evaluating a land exchange proposal are (1) whether the exchange is in the public interest as required under 43 CFR 2200.0-6(b), and (2) whether the value of the interests being acquired is of equal value to the lands or interests being conveyed to private ownership (as required under 43 CFR 2200.0-6(c)).

In making the public interest determination, BLM must consider a number of factors which are outlined in the regulations at 43 CFR 2200.0-6(b). These factors include the opportunity to achieve better management of federal lands, the opportunity to meet the needs of state and local residents and their economies, and the opportunity to secure important objectives. Some of the objectives that should be considered are: protection of fish and wildlife habitats; enhancement of public access, consolidation of lands or interests in lands, and consolidation of split estate lands.

In order to ensure that the lands or interests being exchanged are of equal value, the fair market value of the respective properties must be evaluated. In this case, the fair market value of the P&M lands will be determined through a fee appraisal by a BLM-approved qualified appraiser. BLM will determine the fair market value of the coal to be exchanged. The amount of coal exchanged will be the amount required to equal the value of the P&M lands being acquired and will be in accordance with 43 CFR 2200.

In evaluating this exchange proposal, BLM must also fulfill the requirements of NEPA by evaluating the environmental impacts of the exchange proposal. BLM has determined that the requirements of NEPA would be best served by preparing an EIS. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of exchanging the federal coal which P&M proposes to acquire as well as to the site specific and cumulative impacts of U.S. acquisition of the lands and associated mineral resources offered for exchange by P&M. Although BLM

would not authorize mining by exchanging the federal coal as proposed, the EIS considers the impacts of mining the coal proposed for exchange because that could be a consequence of completing this exchange.

BLM will use the analysis in this EIS in making a public interest determination, in accordance with 43 CFR 2200.0-6(b), on whether to exchange coal for the offered lands.

The USFS is a cooperating agency on this EIS. The Bridger lands in Lincoln County include most of the remaining parcels of private land within the Kemmerer Ranger District of the BTNF. Acquisition of these lands is a high priority for the USFS.

OSM is also a cooperating agency on this EIS. OSM has primary responsibility to administer programs that regulate surface coal mining and the surface effects of underground coal mining operations. If the exchange is completed, the coal would no longer be federally owned, but OSM would retain some oversight responsibilities on the regulation of the proposed surface coal mine.

If the exchange is completed, P&M must complete baseline studies and obtain permit approvals prior to mining. They propose to begin mining the coal by about 2008, depending on market conditions. The mining method would be truck and shovel, and the coal would be sold for use in electric power generation. After mining, the land would be reclaimed for livestock grazing and wildlife use, which is the current use of the PSO Tract.

There are currently no active coal mines in Sheridan County, Wyoming, although coal has been mined from both underground and surface mines in the county in the past. Two surface coal mines are currently active north of Sheridan in Montana (Decker and Spring Creek).

## 1.1 Purpose and Need for Action

P&M, the proponent of this exchange, wishes to acquire the federal coal beneath the PSO Tract in northern Sheridan County, Wyoming, with the intent of eventually opening a surface mine. P&M initiated the proposed exchange.

BLM and USFS are considering the exchange because the lands P&M is offering have important public resource values. The Bridger lands (Figure 1-2) are the largest in-holdings of private lands within the Kemmerer Ranger District of the BTNF. The lands are currently used for grazing, wildlife habitat, recreation and timber production. These uses are consistent with the *BTNF Land and Resource Management Plan*. While these lands remain in private ownership, there is a possibility that they could be subdivided and/or developed, which would not be in conformance with the USFS *BTNF Land and Resource Management Plan*. If the lands are acquired and become public lands, they would be managed with the surrounding USFS lands in

this area. It is a high priority of the USFS to acquire in-holdings within the BTNF boundary.

The Bridger lands located outside the BTNF (Figure 1-2) are surrounded by public lands managed by BLM and the USFS. These lands are situated along Fontenelle and Perkins Creeks. These lands are currently used for livestock grazing and wildlife habitat. If the lands are acquired, they will be incorporated into the existing multiple use management consistent with the other surrounding BLM lands in accordance with the BLM *Pinedale Resource Management Plan*.

The JO Ranch lands (Figure 1-3) are private in-holdings completely surrounded by public lands managed by BLM. These lands are situated along Cow Creek and contain several miles of important riparian habitat within the administrative boundaries of the BLM Rawlins Field Office. These lands are currently used for livestock grazing and wildlife habitat, consistent with the typical uses of the surrounding BLM lands. If the lands are acquired, they will be managed with the other public lands in accordance with the BLM *Great Divide Resource Management Plan*.

The Welch lands (Figure 1-4) are different from the other two properties being offered by P&M in that they are completely surrounded by other private lands. These lands include about two miles of frontage along the Tongue River. If the exchange is completed, this will be the only area of public lands (public access) adjacent to the Tongue River in Wyoming outside the Big Horn National Forest. These lands would be managed by BLM in accordance with the BLM *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (April 2001).

If the exchange is completed, the federal government would acquire all of the surface and mineral estate that P&M owns in the three properties being offered (Bridger, JO Ranch and Welch lands, shown in Figures 1-2, 1-3, and 1-4). As described in Section 1.0, P&M owns all of the surface estate included in these three properties offered for exchange, but owns varying portions of the mineral estate in the lands offered for exchange. In exchange for these lands and minerals, P&M would acquire ownership of an equal value of federal coal beneath the PSO Tract, shown in Figure 1-5. For the purposes of this analysis, it is assumed that all the federal coal identified by P&M for acquisition would be exchanged, but the amount of coal actually offered for exchange would depend upon final appraisals of all the properties. As stated previously, if an exchange is completed, P&M proposes to mine the coal they acquire. There would be no disturbance of the acquired properties if the exchange is completed.

## 1.2 Regulatory Authority and Responsibility

BLM processes land exchanges under the authority provided by Section 206 of FLPMA as amended. A land exchange is a real estate transaction

where the disposal of and acquisition of lands are combined in the same transaction. This exchange will be processed under the regulations at 43 CFR 2200, the 1988 Federal Land Transaction Facilitation Act, BLM Manual H-2200-1 (Land Exchange Handbook, BLM 1997), Public Law No. 106-248, and existing BLM policy.

The BLM is the lead agency responsible for managing federal coal and other minerals. Since the proposal under consideration is to exchange federal coal for other properties, the BLM is responsible for preparation of this EIS to evaluate the potential environmental impacts of completing this exchange. For the P&M exchange, the BLM must decide whether the exchange is in the public interest and must ensure that the properties being exchanged are equal in value.

The Bridger lands would be managed by the Kemmerer Ranger District of the BTNF and the BLM Pinedale Field Office. These lands would be managed according to the 1990 *Bridger Teton National Forest Land and Resource Management Plan*, and the 1988 *Pinedale Resource Management Plan* respectively. The JO Ranch lands would be managed by BLM and are in the area covered by the 1990 *Great Divide Resource Management Plan*. The PSO Tract and the Welch lands are included in the area covered by the *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (April 2001).

SMCRA gives OSM primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. Pursuant to Section 503 of SMCRA, the WDEQ developed, and in November 1980 the Secretary of the Interior approved, a permanent program authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within the State of Wyoming. In January 1987, pursuant to Section 523(c) of SMCRA, WDEQ entered into a cooperative agreement with the Secretary of the Interior authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state.

If an exchange is completed and ownership of the coal is transferred to P&M, the company would be required to submit a detailed permit application package to WDEQ before the coal could be mined. WDEQ/LQD reviews the permit application package to insure the permit application complies with the permitting requirements and the coal mining operation will meet the performance standards of the approved Wyoming program. If the permit application package does comply, WDEQ issues the applicant a permit to conduct coal mining operations.

WDEQ enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority

in environmental emergencies. OSM retains oversight responsibility for this enforcement.

BLM also has the responsibility during preparation of this EIS to consult with and obtain the comments of other state or federal agencies which have jurisdiction by law or special expertise with respect to potential environmental impacts. Appendix A presents other federal and state permitting requirements that would have to be satisfied prior to mining this tract if the federal coal is exchanged.

## 1.3 Relationship to BLM Policies, Plans, and Programs

In addition to the federal acts listed under Section 1.2, guidance and regulations for managing and administering public lands, including the federal coal lands in the P&M exchange proposal, are set forth in 40 CFR 1500 (Protection of Environment), 43 CFR 1601 (Planning, Programming, Budgeting), and 43 CFR 3400 (Coal Management).

Specific guidance for processing exchanges follows BLM Manual H-2200-1 (Land Exchange Handbook, BLM 1997) and 43 CFR 2200. The *National Environmental Policy Act Handbook* (BLM 1988) has been followed in developing this EIS.

As put forth in Executive Order 13212, dated May 18, 2001, all BLM decisions must take into consideration adverse impacts on the President's National Energy Policy. According to BLM Instruction Memorandum No. 2002-053, dated December 12, 2001, it is BLM policy to prepare a "Statement of Adverse Energy Impact" whenever a BLM decision or action will have a direct or indirect adverse impact on energy development, production, supply or distribution. If there is no adverse impact, no Statement needs to be prepared. However, the record of decision (ROD) must note this fact.

The Proposed Action, to exchange privately-owned lands for federally-owned coal, would obviously have no adverse energy impact. The No Action Alternative, denial of the exchange, could adversely effect energy production if it results in the PSO Tract never being mined or if there is a long delay in mining the coal. If the No Action Alternative is selected by BLM, the ROD will have to contain a Statement of Adverse Energy Impact which will address the following:

- rationale why the coal exchange cannot co-exist with other uses of the land;
- alternatives considered in adoption of the No Action Alternative; and
- a qualitative judgement of the impacts of the decision in regards to production lost as well as steps taken to offset the loss.

## 1.4 Conformance with Existing Land Use Plans

FLPMA requires that lands considered for exchange be included in a comprehensive land use plan and

that decisions to exchange the coal be compatible with that plan.

The *BTNF Land and Resource Management Plan* (USFS 1990) governs the management of USFS lands in the area surrounding the Bridger lands. The Forest Plan addresses the acquisition of lands and indicates they will be pursued with willing landowners. BTNF has completed several land exchanges and acquisitions under this plan.

The *Pinedale Resource Management Plan* (BLM 1988) governs and addresses the management of BLM lands in the area surrounding the Bridger lands. The lands that BLM would acquire in this area lie within a retention area and the plan states "… acquisition of non-Federal lands will be pursued, if needed, to accomplish management objectives. Lands action (e.g., exchanges) will be pursued to enhance and maintain key wildlife habitats."

The JO Ranch lands are located in the area managed by the BLM Rawlins Field Office where management of public lands is governed by the *Great Divide Resource Management Plan* (BLM 1990). The plan states that the preferred method of disposal or acquisition of lands by BLM will be through exchange. If the exchange is completed, future management of the land acquired in the Rawlins Field Office area will be determined through additional NEPA analysis/planning decisions.

The Welch lands and the PSO Tract are located in Sheridan County. The *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (April 2001) governs and addresses management of BLM public lands and minerals in Sheridan County. Section 206 of FLPMA, dealing with exchanges, and section 209 of FLPMA, dealing with the reservation and conveyance of minerals, have both been incorporated into the *Buffalo Area Resource Management Plan.* If the exchange is completed, future management of the land acquired in the Buffalo Field Office area will be determined through additional NEPA analysis/planning decisions.

When an application to lease federal coal is received, BLM applies four land use planning screens to determine whether the subject coal is acceptable for consideration for leasing. The four coal screens are:

- development potential of the coal lands;
- unsuitability criteria application;
- multiple land use decisions that eliminate federal coal deposits; and
- surface owner consultation.

Development potential of the coal lands, multiple land use decisions that eliminate federal coal deposits from consideration for leasing and surface owner consultation are not directly applicable in the case of an exchange of federal coal because the coal would not remain under federal ownership if the exchange is completed. The unsuitability criteria apply to both federal and non-federal

coal reserves under Section 522(b) of SMCRA. The presence of some of the resources included in these criteria may prevent mining of both federal and non-federal coal. In that event, the federal coal lessee or the private coal owner is entitled to an exchange for the coal that they cannot mine. BLM does not want to exchange coal that cannot be mined due to federal restrictions because P&M could be entitled to another exchange in the future. Therefore, the unsuitability criteria need to be considered in selecting the coal that should be included in the exchange.

The coal mining unsuitability criteria are listed in the federal coal management regulations at 43 CFR 3461. These unsuitability criteria were applied to federal coal lands in Sheridan County in the early 1980s and in the mid 1990s by the BLM. The 1980s results were included in the 1985 *Buffalo Area Resource Management Plan*. The results of the mid-1990s unsuitability criteria application are summarized in the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office*.

The unsuitability findings for the PSO Tract according to the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* are summarized in Appendix B of this EIS. The findings for Criteria 14 and 15 are discussed in more detail below.

Portions of the PSO Tract totaling about 520 acres were found to be unsuitable for coal leasing and development under Criterion 14 (Habitat for Migratory Birds) when the unsuitability criteria were applied in the early 1980s. The designation was applied due to the presence of breeding habitat for the Lewis' woodpecker. This species is known to breed in the ponderosa pine habitat in the area of Ash Creek. BLM has reviewed this unsuitability finding and determined that Lewis' woodpeckers have been dropped from the list of "Migratory non-game birds of management concern in the U.S." BLM advised USFWS of their intent to drop the unsuitability designation for Lewis' woodpecker habitat under Criterion 14 within this area and to complete a land use plan maintenance action to reflect this. In a letter dated August 20, 2001, USFWS indicated their willingness to concur with the proposed change in unsuitability designation for Criterion 14; however, they requested that the scoria hillsides on the western edge of the exchange area be removed from the exchange. If those areas remain in the exchange tract, the USFWS will require monitoring of the Lewis' woodpecker as part of their mining permit.

The 1985 BLM *Buffalo Area Resource Management Plan* found approximately 1,200 acres of federal coal to be unsuitable due to the presence of the Lewis' woodpecker under Criterion 15, Habitat for State High-Interest Species, and some of this acreage overlaps with the western edge of the PSO Tract. The WGFD submitted comments in response to the exchange notice identifying the Lewis' woodpecker as

a state species of special concern that is found in the Ash Creek area in a letter dated January 30, 2001. In their comment letter, WGFD stated that they believe the exchange "will not significantly impact Lewis' woodpeckers, and that any concerns related to the Lewis' woodpecker could be adequately addressed during mine planning if active coal mining is proposed." When contacted, WGFD indicated that, due to the extent of their occurrence in Wyoming, Lewis' woodpeckers are not considered rare or in need of management emphasis.

On October 24, 2001, the *Buffalo Area Resource Management Plan* designation of a portion of the Sheridan Review Area as "unsuitable pending further study" for Lewis' woodpecker habitat was removed in a plan maintenance action signed by the Field Office Manager.

## 1.5 Consultation and Coordination

### Initial Involvement

BLM received P&M's coal exchange proposal on February 4, 1999. The exchange proposal was initially reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization. On October 31, 2000, the National Land Exchange Evaluation and Assistance Team concluded their technical review of the exchange proposal and concurred with Wyoming BLM's request to proceed with processing the exchange.

The PRRCT reviewed this exchange proposal at a public meeting held on October 27, 1999, in Gillette, Wyoming. P&M presented information about their proposed exchange application to the PRRCT at this meeting. The PRRCT recommended that the BLM continue to process the exchange and instructed BLM to proceed with an EIS to evaluate the environmental effects of the exchange. The exchange was assigned case serial number WYW148816.

The BLM filed a Notice of Intent to Prepare an EIS and a Notice of Scoping in the *Federal Register* on February 14, 2001. The filing served as notice that the P&M exchange proposal had been received and public comment was requested.

Public scoping meetings were held on March 5, 2001 in La Barge, Wyoming, March 6, 2001 in Rawlins, Wyoming and March 7, 2001 in Sheridan, Wyoming. At the public meetings P&M, BLM and USFS personnel orally presented information about the exchange process and the properties proposed for exchange. The presentations were followed by a question and answer period, during which oral comments were made. The scoping period extended from February 14 through March 31, 2001, during which time BLM received 23 written comments.

Chapter 5.0 provides a list of other federal, state, and local governmental agencies that were consulted in preparation of this EIS (Table 5-1)

and the distribution list for this EIS (Table 5-3).

**Issues and Concerns**

Issues and concerns expressed by the public and government agencies relating to the exchange proposal are summarized below. As might be expected, the issues and concerns expressed are related to location. That is, people in Lincoln and Carbon Counties were most concerned with management of the acquired lands if the exchange is completed, while people in Sheridan County were more interested in the potential mining of the coal.

Issues and concerns are summarized as follows:

- Mineral ownership of acquired lands and whether these lands would be available for mineral development;
- Fate of existing timber roads;
- Grazing rights on the acquired lands;
- Effect on county tax base if these lands change from private to public ownership;
- Question of who underwrites the expense of the exchange;
- Ownership and use of the water rights on the JO Ranch lands;
- Fate of the buildings on the JO Ranch lands;
- Potential conflicts with oil and gas development on the PSO Tract;
- Access to the proposed mine on the PSO Tract and facilities to ship coal out;
- Post-mine land uses on the PSO Tract;
- Effects of blasting on nearest residents to the PSO Tract;
- Effects of mining on air quality;
- Expected revenues from the mining operation;
- Public access to Welch lands;
- Cumulative impacts of mineral development to other resources (e.g., groundwater, surface water, etc.);
- Potential impacts on cultural and paleontological resources;
- Potential impacts on T&E species and MBHFI;
- Need for the exchange;
- Reasonable alternatives to the exchange;
- Encumbrances on the lands being exchanged;
- Wetland impacts.

**Draft EIS**

Parties on the distribution list are being sent copies of this DEIS, and copies are being made available for review at the BLM offices in Casper, Rawlins, Buffalo, Pinedale and Cheyenne, and the USFS office in Kemmerer. Notices announcing the availability of the DEIS will be published in the *Federal Register* by the EPA and BLM. A 60-day comment period on the DEIS will commence with publication of the EPA Notice of Availability.

**Final EIS, Department of Justice Consultation and ROD**

All comments received on the DEIS will be included, with agency responses, in the FEIS. Availability of

the FEIS will be published in the *Federal Register* by the BLM and the EPA. This notice will also announce a public meeting or meetings to receive public comments on the public interest factors of the proposed exchange, as required by 43 CFR 2203.3. There will be a 30-day availability period for the FEIS.

After the public meeting or meetings are held and the 30-day availability period has ended, BLM will forward to the Attorney General copies of the comments received in response to the request for public comments, the transcript of the public meeting or meetings, and copies of the written comments received at the public meeting or meetings. The Attorney General has 90 days to advise BLM, in writing, on the anti-trust consequences of the proposed exchange. The Attorney General may request additional information, which may extend the 90-day period. If the Attorney General does not respond within the 90-day time frame, BLM may proceed with the exchange.

Any advice received from the Attorney General becomes part of the public record. The ROD will include a discussion of the consideration which is given to any advice that is received from the Attorney General related to this exchange.

Prior to preparation of the ROD, the final appraisals will be completed and BLM will request the concurrence of the Department of Interior Solicitor on the ROD and the Notice of Availability of the ROD. Once the Solicitor's concurrence is received, the BLM Wyoming State Director will request the concurrence of the BLM Washington Office through the National Land Exchange Evaluation and Assistance Team.

The ROD for the exchange will be mailed to parties on the mailing list and others who commented on this exchange during the NEPA process. The BLM decision may be protested within 45 days after publication of a notice of the availability of a decision to approve or disprove an exchange proposal. The right of appeal from a protest decision may be pursued in accordance with 43 CFR part 4. The transfer of deeds and other administrative procedures to complete the exchange will follow.

# 2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives to this action. The Proposed Action is to complete an exchange of the Bridger, JO Ranch and Welch lands for the federal coal beneath the PSO[1] Tract. It is assumed that the PSO Tract would be developed as a new mine. The lands which would be acquired in exchange for the coal would be managed by the USFS (Bridger lands within the BTNF) and BLM (Bridger lands outside the BTNF, JO Ranch and Welch lands).

The No Action Alternative (Alternative 1) is to not complete the exchange. Selection of this alternative would mean that the lands being offered for exchange would remain in private ownership and the federal coal underlying the PSO Tract would remain in federal ownership.

Other alternatives considered include:

- not exchanging or leasing the coal but purchasing the lands offered by P&M Coal for the appraised value (Alternative 2); and
- holding a competitive lease sale for federal coal in the PSO Tract, with the assumption that it would be developed as a new mine by any qualified bidder who acquires the lease (Alternative 3).

[1] Refer to page viii for a list of abbreviations and acronyms used in this document.

The exchange was proposed by P&M as a way to acquire coal beneath their surface in the PSO Tract. The lands they are offering in exchange are attractive to the federal government. The Bridger lands are in-holdings surrounded by BTNF and BLM lands and the JO Ranch lands are in-holdings surrounded by BLM lands. The Welch lands have considerable wildlife value and their acquisition would create a unique opportunity for the public to access the Tongue River in Sheridan County.

## 2.1 Proposed Action

Under the Proposed Action, the exchange would be completed and the Bridger, JO, and Welch lands would become public lands. P&M would acquire ownership of an amount of federal coal underlying the PSO Tract that would be equal in value to the properties they are offering for exchange.

The lands and minerals that would become public lands and minerals if the exchange is completed are described below.

<u>Bridger Lands</u>
<u>Lincoln County, Wyoming</u>

The legal description of the Bridger lands and mineral interests that P&M is offering to exchange (shown in Figure 1-2) is as follows:

<u>Lands to be administered by BLM</u>:
T. 26 N., R. 115 W., 6th PM, Wyoming
Tracts 49, 57, and 71;
Total: 638.37 acres more or less.

Lands to be administered by USFS:
T. 26 N., R. 116 W., 6th PM, Wyoming
Tracts 39, 41, and 42;

T. 26 N., R. 117 W., 6th PM, Wyoming
Tracts 37 through 43;

T. 27 N., R. 117 W., 6th PM, Wyoming
Tracts 37 through 42.
Total: 2,447.88 acres more or less.

Minerals to be administered by BLM:
T. 26 N., R. 115 W., 6th PM, Wyoming
Tracts 49, 57, and 71;
Total: 638.37 acres more or less.

Minerals to be administered by USFS:
T. 26 N., R. 116 W., 6th PM, Wyoming
Tracts 39, 41, and 42;

T. 26 N., R. 117 W., 6th PM, Wyoming
Tracts 37 through 43;

T. 27 N., R. 117 W., 6th PM, Wyoming
Tracts 37 through 42.
Total: 2,447.88 acres more or less.

The Bridger lands are surrounded by public lands and minerals administered by the BLM and the USFS. Under the proposed action, if these lands become public lands, the acquired surface and mineral estates would be managed like the surrounding public lands in accordance with the BLM *Pinedale Resource Management Plan* and the USFS *BTNF Land and Resource Management Plan*.

JO Ranch Lands
Carbon County, Wyoming

The legal description of the JO Ranch lands and mineral interests that P&M is offering to exchange (shown in Figure 1-3) is as follows:

Lands
T. 16 N., R. 90 W., 6th PM, Wyoming
Tract 46;
Section 6: Lots 20, 23, 24, 27, NE¼SW¼;
Section 17: SW¼SW¼;
Section 18: NE¼SE¼;

T. 16 N., R. 91 W., 6th PM, Wyoming
Section 12: NE¼NE¼, SW¼NE¼, SW¼SW¼, E½SW¼, W½SE¼;
Section 13: W½NW¼, SE¼NW¼, NW¼SW¼;
Section 14: SE¼NE¼, NE¼SE¼, S½SE¼;
Section 22: SE¼SE¼, SE¼SE¼SW¼SE¼;
Section 23: W½NE¼, S½NW¼, N½SW¼, SW¼SW¼.
Total: 1,236.47 acres more or less.

Minerals
P&M does not own and is not offering for exchange any of the minerals underlying the JO Ranch lands.

The JO Ranch lands are surrounded by public lands and minerals administered by the BLM. Under the proposed action, if these lands become public lands, future management of the acquired surface estate will be determined through additional NEPA analyses and planning decisions.

Welch Lands
Sheridan County, Wyoming

The legal description of the Welch lands and mineral interests that P&M is offering to exchange (shown in Figure 1-4) is as follows:

T. 57 N., R. 84 W., 6th PM, Wyoming

| | |
|---|---|
| Section 1: | S½NE¼, SE¼NW¼, N½SW¼, SW¼SW¼; |
| Section 2: | Lots 2, 3, S½N½, S½; |
| Section 3: | Lots 3,4, S½N½, N½S½, SE¼SE¼; |
| Section 4: | Lots 1 through 4, S½NE¼, SE¼NW¼, N½SE¼. |

Total: 1,600.41 acres more or less.

Minerals
P&M owns and is offering to exchange the coal rights underlying the following lands:

T. 57 N., R. 84 W., 6th PM, Wyoming

| | |
|---|---|
| Section 1: | S½NE¼, SE¼NW, SW¼SW¼; |
| Section 2: | S½NW¼, S½; |
| Section 3: | S½NE¼, SE¼NW¼, N½SW¼, SE¼SE¼. |

Total: 800 acres.

P&M does not own and is not offering to exchange any other mineral rights underlying the Welch lands.

The Welch lands are surrounded by private lands and private and federal minerals. The federal minerals are administered by the BLM. Under the proposed action, if these lands are acquired the BLM Buffalo Field Office would determine future management of these lands through additional NEPA analyses and planning decisions.

PSO Tract
Sheridan County, Wyoming

The legal description of the federal coal being considered for exchange under the Proposed Action (the PSO Tract, shown in Figure 2-1) is as follows:

T.58N., R.84W., 6th P.M., Sheridan County, Wyoming

| | |
|---|---|
| Section 15: | Lot 1; |
| Section 20: | SE¼; |
| Section 21: | E½NE¼, S½; |
| Section 22: | NW¼, W½SW¼; |
| Section 23: | Lots 3 and 4; |
| Section 27: | W½NW¼, W½SW¼; |
| Section 28: | All |
| Section 29: | NE¼, NE¼SE¼; |
| Section 33: | N½NE¼; |
| Section 34: | SW¼NE¼, NW¼NW¼. |

Total selected area:
2,045.53 acres more or less.

The land description and acreage are based on the BLM Status of Public Domain Land and Mineral Title approved Coal Plat as of November 12, 1999. BLM is considering a thorough field investigation and conditional corrective resurvey in T.58N., R. 84W.

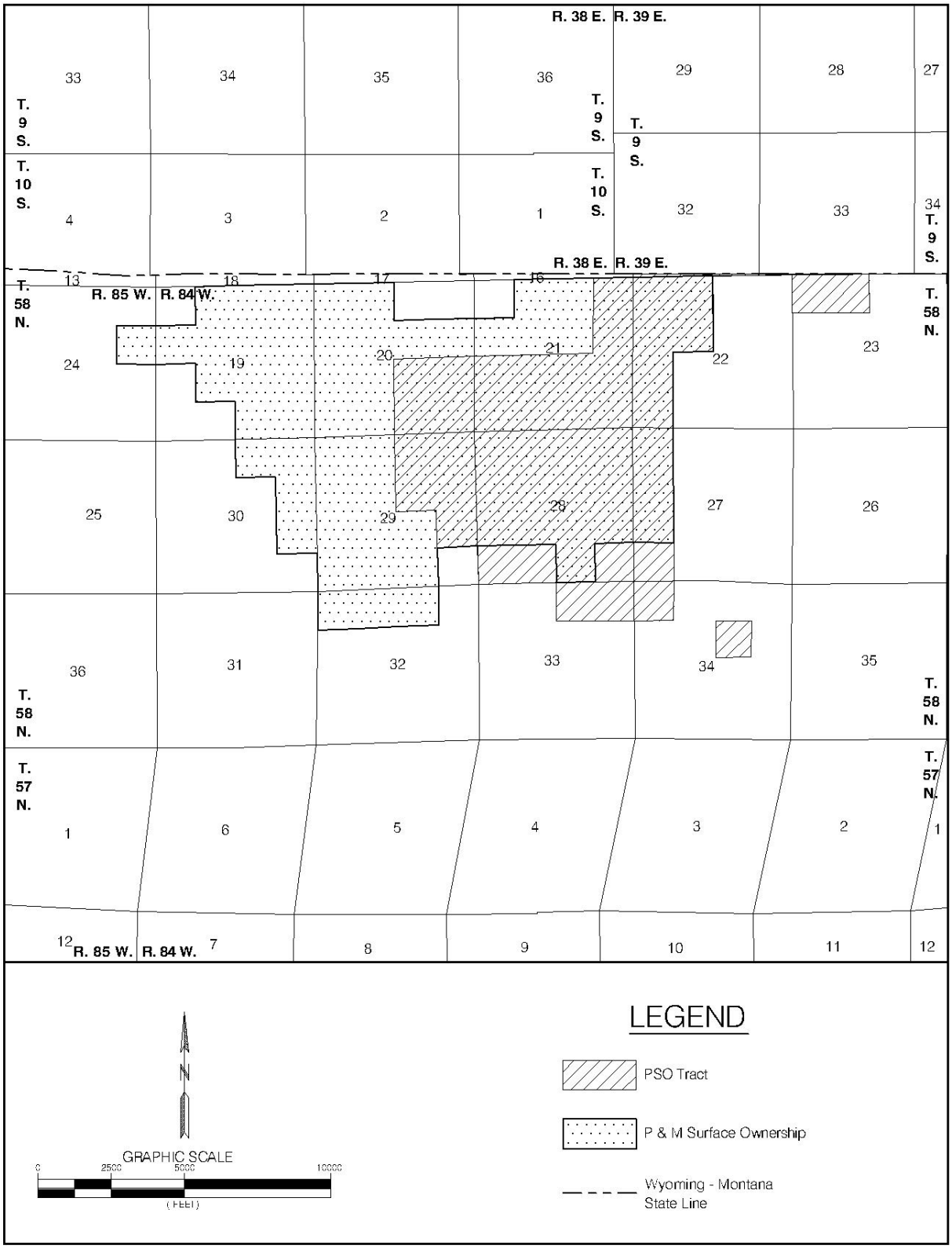



Figure 2-1. PSO Tract Configuration as Proposed.

after receiving information from a private surveyor in 2001 which indicates that the 1952 BLM dependent resurvey missed the original survey corners in this township. The corrective resurvey area would include the PSO Tract.

The Proposed Action assumes that the exchange will be completed and P&M will acquire and mine the federal coal included in the tract described above. For purposes of analysis, it is assumed that all the federal coal within the PSO Tract as proposed by P&M would be included in the exchange. The actual amount of coal that would be exchanged would depend upon the appraisal process.

If an exchange is completed, a detailed mining and reclamation plan would have to be developed and approved before P&M could begin mining on the tract. As part of the approval process, the mining and reclamation plan would undergo detailed review by state and federal agencies. The mining and reclamation plan would include monitoring and mitigation measures that are required by SMCRA and Wyoming State law. These monitoring and mitigation measures are considered to be part of the Proposed Action during the exchange process because they are regulatory requirements.

The final, detailed mining and reclamation plan which must be approved prior to initiation of mining could potentially differ from the plan used to analyze the impacts of the Proposed Action in this EIS. Figure 2-2 is a schematic mine plan prepared by P&M which is described below. The schematic mine plan shown in Figure 2-2 includes privately-owned coal which lies outside of the PSO tract and which is not included in the exchange proposal. The differences between the final, detailed mining and reclamation plan that P&M would be required to submit for approval prior to mining and the P&M's proposed mine plan shown in Figure 2-2 would not be expected to significantly change the impacts described in this EIS. These differences would typically be related to the details of mining and reclaiming the tract but major factors like tons of coal mined, yards of overburden removed, acres disturbed, etc. would not be significantly different from the plan used in this analysis.

Although the total area of the PSO Tract is about 2,045 acres, not all of this area contains coal that is economically recoverable under foreseeable conditions. Faulting, spontaneous combustion and other geologic factors have removed the coal or rendered it uneconomic to recover. The PSO Tract is not a single, contiguous tract of land (see Figure 1-5), and PSO's mine plans include mining the PSO Tract in conjunction with adjacent, privately-owned coal. P&M estimates that there are 153.2 million tons of mineable coal within the Mine Plan area, of which about 112.5 million tons are in the PSO Tract and are currently owned by the federal government. The total area to be mined under P&M's proposed mine plan is about 1,720 acres, of which

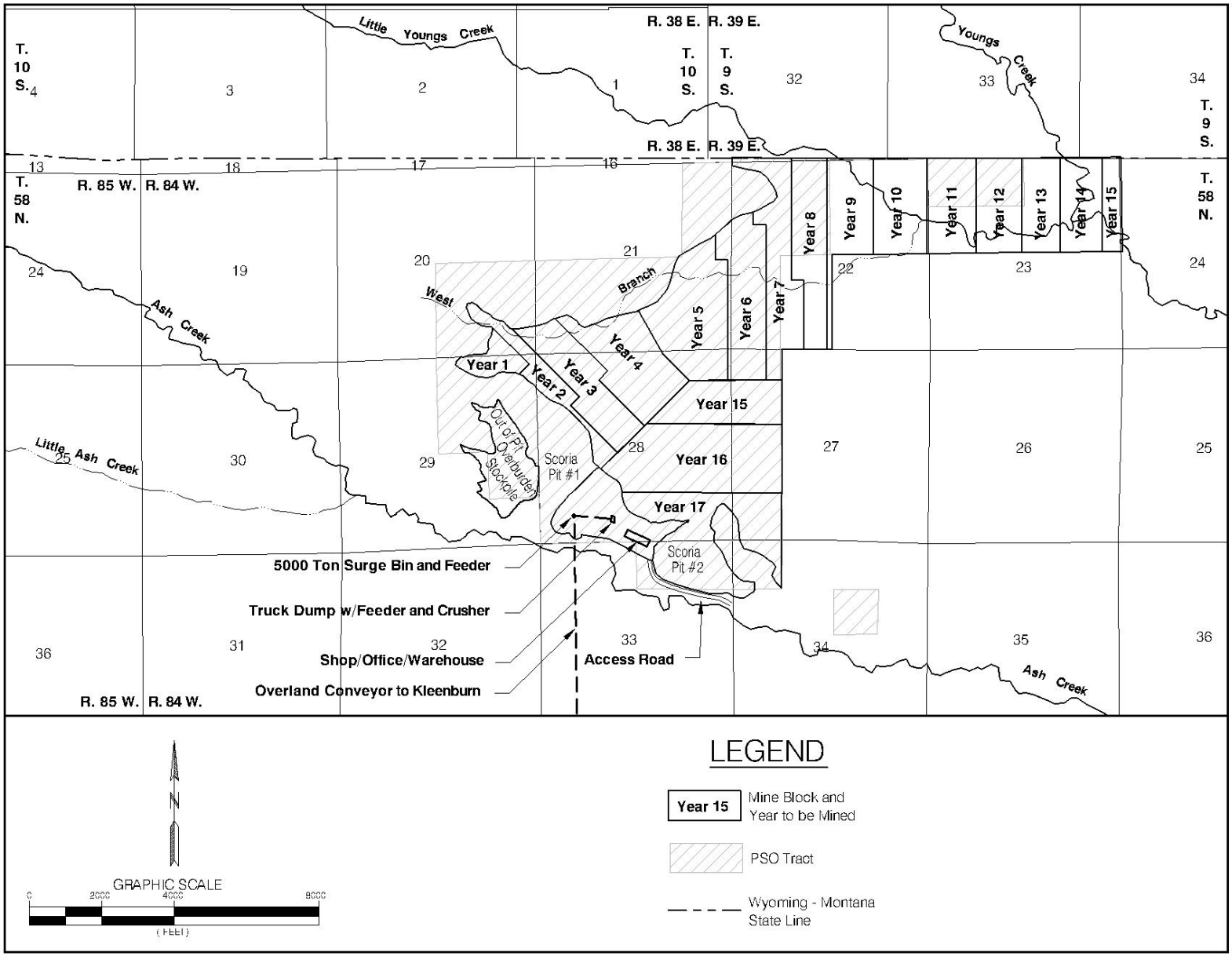



Figure 2-2. Schematic Mine Plan for the Ash Creek Mine.

1,244 acres are on the PSO Tract. P&M assumes that about 95 percent of the mineable coal is recoverable, based on historical recovery factors at typical PRB surface coal mines. This would mean that 145.5 million tons, 107 million tons of which are on the PSO Tract and are now federally owned, would be recoverable over the life of the mine. An estimated total of 356.1 million bank cubic yards of overburden would be excavated.

BLM will independently evaluate the volume and average quality of the coal resources included in the PSO Tract as part of the fair market value determination process. BLM's estimate of the mineable reserves and average quality of the coal included in the tract will be published in the final appraisal. Some coal quality information in the area of the PSO Tract is included in Section 3.4.3 of this document.

The total area of proposed disturbance would be about 2,595 acres. The area of disturbance would exceed the area of coal removal due to incidental disturbances associated with mining the coal such as topsoil buffer areas, scoria mining, grading to blend naturally with reclaimed contours, and surface facilities which could include shop/office/warehouse buildings, truck dump with crushing and feeding equipment, transfer conveyor, surge storage bin and feeder, a 24,000-foot long overland conveyor, rail loop and loadout facility, haul roads and access road.

P&M proposes to utilize shovel and truck equipment similar to those commonly utilized in the industry at other PRB surface coal mines. Typical equipment sizes which could be used would include 240 to 320 ton trucks matched with 60 to 80 ton capacity shovels. These primary equipment units would be used to remove overburden and interburden as well as mine coal. The mine plan layout depicted schematically on Figure 2-2 was prepared by P&M to show recovery of coal within the proposed mine plan area using this equipment. P&M refers to the proposed mine as the Ash Creek Mine for planning purposes.

Mining would begin with a boxcut immediately west of the facilities area and extend across the western portion of the south end of the mining area. Overburden from the boxcut would be placed in an overburden stockpile located adjacent to the south side of the mining area but separated from Ash Creek to control surface water run-off in the area. The boxcut would be opened to establish an operating pit approximately 350 feet wide which would advance in a parallel manner with subsequent cuts. A pit length of approximately 2,500 feet would be maintained. Multiple seams would be mined, and coal would be blended as needed to address customer coal quality constraints.

The proposed mining sequence would allow expansion into adjacent private coal reserves during the later part of the mine life. This private coal is shown being mined in years 9 through 15 of the schematic mine plan shown on Figure 2-2.

Supporting equipment that would be utilized includes motor graders, crawler tractors, water trucks, scrapers, maintenance equipment, pumps, light plants and related equipment common to the industry.

The proposed surface coal mining operation envisioned for the mine would include relatively simple facilities and associated infrastructure. A facilities area would be developed adjacent to Ash Creek along the southeast part of the mining area. This would be an above drainage location to facilitate control of surface water. The site would be protected and not visible from surrounding areas as it would not be above surrounding topography. This would help to mitigate any concerns for visual, noise, or fugitive dust effects from the operation.

Facilities to be located at this site would include a maintenance shop, warehouse, employee bathhouse, and mine office complex as a single building unit. Equipment parking, employee and vendor parking, outside storage, and other improved site areas for fuel storage, equipment "lay-down" and other requirements of a surface coal mining operation would be provided within the facilities area.

The truck dump, crushing, and conveying facilities would be located at this site. A transfer conveyor belt would be used to convey the crushed coal to a 5,000 ton capacity surge bin/silo which would serve as the feed for an overland conveyor.

An overland conveyor would be used to transport coal to a unit train loadout facility on the BNSF mainline due south of the operation. An overland conveyor was selected to minimize disturbance at the site and reduce development costs while maximizing use of existing facilities located near the recently reclaimed Big Horn Coal Company loadout facilities.

A logical production build-up has been developed for the proposed mining operation. Production with opening of the boxcut would begin at one million tons and build over the next three years to a steady-state annual production for the remaining mine life at 10 million tons. This schedule provides for a mine life of 17 years. This level of production approximately matches and maximizes production of overburden from one shovel. A projection of annual production of overburden/ interburden and coal is shown on Table 2-1.

Reclamation activities which would be completed at the mine site include topsoil removal and replacement, drainage and sediment control, backfilling and grading, and seeding and planting according to the regulations of WDEQ/LQD. Topsoil would be removed and stockpiled or directly placed on re-graded surfaces. Once the operation is in a steady-state production condition, topsoil would be directly placed on graded backfill to minimize the need for stockpiling and rehandling.

Table 2-1. Production Schedule

| Year | Production (Millions) | |
|---|---|---|
| | Coal (Tons) | Overburden (bcy) |
| 1 | 1.0 | 3.0 |
| 2 | 2.5 | 5.4 |
| 3 | 5.0 | 11.4 |
| 4 | 7.0 | 19.9 |
| 5 | 10.0 | 27.7 |
| 6 | 10.0 | 28.1 |
| 7 | 10.0 | 24.6 |
| 8 | 10.0 | 22.8 |
| 9 | 10.0 | 23.3 |
| 10 | 10.0 | 26.4 |
| 11 | 10.0 | 23.4 |
| 12 | 10.0 | 21.7 |
| 13 | 10.0 | 12.9 |
| 14 | 10.0 | 12.2 |
| 15 | 10.0 | 27.1 |
| 16 | 10.0 | 34.0 |
| 17 | 10.0 | 32.2 |
| **Total** | 145.5 | 356.1 |

Drainage and sediment control structures would be used to control surface water quality at the site. It is assumed that there would be only minor groundwater inflow into the active mine pit and therefore structures would not be required for any groundwater dewatering needs. Several sediment ponds, gravel check dams, grass filters, and other best available control technology structures would be used as required to control surface water quality from mining and reclamation activities.

Grading of backfilled spoil would be completed to establish a postmining surface which would resemble the premining topography and would be approved by WDEQ. The postmining topography would be somewhat lower in elevation than the premining topography due to coal removal. However, given the drainage configuration of the site, positive drainage could be established in the postmining topography with completion of reclamation activities.

The mining and reclamation plan would be reviewed by WDEQ/LQD and P&M would make any changes necessary in order to secure the permit to mine.

The mine would employ about 70 persons at normal operating capacity.

Hazardous and Solid Waste

Solid waste which would be produced at the Ash Creek Mine consists of

floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. The mine would dispose of its solid wastes within its permit boundary in accordance with WDEQ-approved solid waste disposal plans. Sewage generated by mining would be handled by WDEQ-permitted sewage systems to be constructed on site.

Maintenance and lubrication of most of the equipment would take place at the shop facilities. Major lubrication, oil changes, etc., of most equipment would be performed inside the service building lube bays, where waste oil would be contained and deposited in storage tanks. The collected waste oils would then be recycled offsite.

P&M has reviewed the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Re-authorization Act* (SARA) *of 1986* (as amended) and EPA's *List of Extremely Hazardous Substances* as defined in 40 CFR 355 (as amended) for hazardous substances which may be used at the Ash Creek Mine. P&M would maintain files containing Material Safety Data Sheets for all chemicals, compounds and/or substances which are or would be used during the course of mining.

P&M would be responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of mining are in accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All mining activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

P&M would be required to comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended. The materials for which such notification must be given are the extremely hazardous substances listed in Section 302 of the *Emergency Planning and Community Right to Know Act* and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice must be given to the WDEQ Solid and Hazardous Waste Division and all other appropriate federal and state agencies.

Each mining company is expected to prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies include:

- Spill Prevention Control and Countermeasure Plans;
- Spill Response Plans;
- Inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; and
- Emergency Response Plans.

All mining operations are also required to be in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, and the Federal Clean Air Act. In addition, mining operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

## 2.2 Alternative 1

Alternative 1 is the No-Action Alternative. Under the No-Action Alternative, the exchange would not be completed.

For purposes of this analysis, it is assumed that if the No-Action Alternative is selected, the federal coal in the PSO Tract would not be mined in the foreseeable future. Selection of this alternative would not preclude leasing of this federal coal in the future. Under the No-Action Alternative it is also assumed that the Bridger lands, JO Ranch lands and Welch lands would remain in private ownership. The Bridger lands would remain private in-holdings in the BTNF and the BLM Pinedale Field Area. The JO lands, including the JO Ranch buildings, which are eligible for National Historic Site status, would remain private in-holdings in the BLM Rawlins Field Area. The Welch lands, which represent a unique opportunity for public access to the Tongue River in Wyoming outside of the Big Horn National Forest, would remain in private hands. For the purpose of this analysis, no other assumption is made about the future use of these lands. However, based on information P&M has provided, it is likely that these lands would be sold on a competitive bid basis. These sales could result in subdivision and rural development of these lands.

## 2.3 Alternatives Considered but not Analyzed in Detail

### 2.3.1 Alternative 2

Alternative 2, which is based on a comment received during the scoping process, assumes that the exchange does not take place and the government purchases the offered lands from P&M. This alternative assumes that P&M would be willing to sell the offered lands for the appraised value. Although P&M has indicated that they would sell the lands on a competitive bid basis if the exchange is not completed, BLM does not have funding or a funding mechanism to acquire these lands through purchase. Therefore, this alternative was not analyzed in detail.

Under this alternative, the U.S. would acquire the P&M tracts. The coal could potentially be leased and mined, but it would not be mined as a result of an exchange. The environmental impacts would be similar to the Proposed Action for the lands to be acquired (Bridger lands, JO Ranch lands and Welch lands) and similar to the No-Action Alternative for the PSO Tract.

2.3.2 Alternative 3

Under Alternative 3 the federal government would hold a competitive lease sale for the coal beneath the PSO Tract and use the revenue generated to purchase the lands offered by P&M.

Since decertification of the Powder River Basin as a coal producing region, federal coal has been leased in response to applications for maintenance tracts to extend the lives of existing mines. The PSO Tract would not be a maintenance tract and BLM has not received an application to lease any of the federal coal included in the PSO Tract.

The revenue that would be generated if the coal was mined would go into the General Fund and could not be diverted from the Treasury to purchase the P&M lands without Congressional action. Therefore, this alternative is not analyzed in detail in this EIS.

The environmental impacts of this alternative would be similar to the environmental impacts of the Proposed Action assuming that the coal would be leased and mined.

## 2.4 Comparison of Alternatives

The locations of the lands which P&M is offering for exchange for the federal coal included in the PSO Tract are shown on Figures 1-1 through 1-4. The location of the federal coal that P&M would acquire under the Proposed Action is shown on Figure 2-1. Table 2-2 summarizes the lands and minerals that P&M is offering for exchange under the Proposed Action. Table 2-3 compares the Proposed Action and the No Action Alternative (Alternative 1) in terms of projected coal production, surface disturbance, mine life, and federal and state revenues.

Table 2-4 presents a comparative summary of the direct and indirect environmental impacts of implementing the Proposed Action as compared to the No-Action Alternative. Table 2-5 presents a comparative summary of cumulative environmental impacts of implementing each alternative. The environmental consequences of the Proposed Action and Alternative 1 are analyzed in Chapter 4.0.

These summary impact tables are derived from the following explanation of impacts and magnitude. NEPA requires all agencies of the federal government to include, in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:

(i) the environmental impact of the Proposed Action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the Proposed Action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented (42 USC § 4332[C]).

Impacts can be beneficial or adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation) or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgement of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

Table 2-2. Summary Comparison of Lands and Minerals Offered for Exchange by P&M

| Tract | Proposed Action | | | No Action Alternative | |
|---|---|---|---|---|---|
| | Surface Estate (acres) | Mineral Estate (All Minerals) (acres) | Mineral Estate (Coal Only) (acres) | Surface Estate (acres) | Mineral Estate (acres) |
| Bridger | 3,086.25 | 3,086.25 | 0.00 | 0.00 | 0.00 |
| JO Ranch | 1,236.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| Welch | 1,600.41 | 0.00 | 800.00 | 0.00 | 0.00 |
| **TOTAL** | 5,923.13 | 3,086.25 | 800.00 | 0.00 | 0.00 |

Table 2-3. Summary Comparison of Coal Production, Surface Disturbance, and Revenues for the PSO Tract

| Item | Proposed Action | No Action Alternative |
|---|---|---|
| Mineable Federal Coal | 112.5 million tons | none |
| Recoverable Federal Coal | 107.0 million tons | none |
| Area of Federal Coal Exchanged | 2,045 acres | none |
| Area of Federal Coal to be Mined | 1,244 acres | none |
| Total Area to Be Disturbed by Coal Mining[1] | 2,595 acres | none |
| Average Annual Coal Production | 10 million tons | none |
| Average No. of Employees | 70 | none |
| Total Projected State Revenues[2] | $ 80.25 million | none |
| Total Projected Annual Revenues to Sheridan County[3] | $ 6 million | none |

[1] Includes disturbance due to mining, overburden stockpiling, construction of surface facilities, scoria mining and related disturbance.

[2] Projected revenue to State of Wyoming is $0.75 per ton of coal sold and includes income from severance tax, property and production taxes, sales and use taxes, and exclude Wyoming's share of federal royalty payments (University of Wyoming 1994) (refer to Section 4.4.19 of this EIS). Figures are for PSO Tract only.

[3] Based on a coal price of $8.00 per ton and production rate of 10 million tons per year, including coal from PSO Tract and adjacent privately owned coal in mine plan area. Includes counties' share of severance taxes, property taxes, sales and use taxes.

Table 2-4. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts[2] for the Proposed Action, and the No-Action Alternative for the P&M Exchange.

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| | **BRIDGER LANDS** | |
| **TOPOGRAPHY AND PHYSIOGRAPHY, GEOLOGY AND MINERALS, SOILS, AIR QUALITY, WATER QUALITY, ALLUVIAL VALLEY FLOORS, WETLANDS, VEGETATION, WILDLIFE, THREATENED, ENDANGERED AND CANDIDATE SPECIES, RESOURCES, CULTURAL RESOURCES, NATIVE AMERICAN CONCERNS, PALEONTOLOGICAL RESOURCES, VISUAL RESOURCES, NOISE, TRANSPORTATION FACILITIES** | Negligible, beneficial permanent on Bridger land. Lands would become public lands. USFS and BLM would manage surface and mineral resources in accordance with existing land use plans. No change in management anticipated. | Nature, extent and duration of impacts would depend on private landowner. Lands would remain private lands. Resources could be affected by any development conducted by private landowner. |
| **LAND USE AND RECREATION** | Moderate, beneficial and adverse permanent on Bridger lands. Public access would be ensured. Private grazing leases would be lost. | Nature, extent and duration of impacts would depend on private landowner. Lands would remain private lands. Public access would not be ensured. Status of grazing leases would not change. |
| | **JO RANCH LANDS** | |
| **TOPOGRAPHY AND PHYSIOGRAPHY, GEOLOGY AND MINERAL, SOILS, AIR QUALTIY, ALLUVIAL VALLEY FLOORS, WETLANDS, NATIVE AMERICAN CONCERNS, PALEONTOLOGICAL RESOURCES, VISUAL RESOURCES, NOISE, TRANSPORTATION FACILITIES** | Negligible, beneficial permanent on JO Ranch lands. Lands would become public lands. BLM would manage surface resources in accordance with land use plans which would be revised to address management of these lands. | Nature, extent and duration of impacts would depend on private landowner. Lands would remain private lands. Resources could be affected by any development conducted by private landowner. |
| **WATER RESOURCES, VEGETATION, WILDLIFE, THREATENED, ENDANGERED AND CANDIDATE SPECIES, LAND USE AND RECREATION, CULTURAL RESOURCES** | Moderate, beneficial and adverse permanent on JO Ranch lands. BLM would manage surface resources in accordance with land use plan. Management of Cow Creek riparian area, JO Ranch buildings, and sand hills habitat would be addressed in land use plan change. Public access would be ensured. Private grazing leases would be lost. | Nature, extent and duration of impacts would depend on private landowner. Lands would remain private lands. Resources could be affected by any development conducted by private landowner. Public access would not be ensured. Status of grazing leases would not change. |

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts[2] for the Proposed Action, and the No-Action Alternative for the P&M Exchange (Continued).

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| | **WELCH LANDS** | |
| **TOPOGRAPHY AND PHYSIOGRAPHY, GEOLOGY AND MINERALS, SOILS, AIR QUALITY, WATER RESOURCES, ALLUVIAL VALLEY FLOORS, WETLANDS, VEGETATION, WILDLIFE, THREATENED, ENDANGERED AND CANDIDATE SPECIES, CULTURAL RESOURCES, NATIVE AMERICAN CONCERNS, PALEONTOLOGICAL RESOURCES, VISUAL RESOURCES, NOISE, TRANSPORTATION FACILITIES** | Neglibile, permanent on Welch lands. Lands would become public lands. BLM would manage surface resources in accordance with land use plans which would be amended to address management of these lands. | Nature, extent and duration of impacts would depend on private landowner. Lands and minerals other than coal would remain private. Resources could be affected by any development conducted by private landowner. |
| **LAND USE AND RECREATION** | Moderate, beneficial and adverse permanent on Welch lands. BLM would manage surface and coal resources in accordance with land use plan. Public access would be ensured. Existing uses could continue. Other land uses would be evaluated in land use plan amendment. Private grazing leases would be lost. | Nature, extent and duration of impacts would depend on private landowner. Lands and minerals other than coal would remain private. Resources could be affected by any development conducted by landowner. Public access would not be ensured. Status of grazing leases would not change. |
| | **PSO TRACT** | |
| **TOPOGRAPHY & PHYSIOGRAPHY** | | |
| PERMANENT TOPOGRAPHIC MODERATION could result in: | | |
| Microhabitat reduction | Moderate, long term on mine area | none |
| Habitat diversity reduction | Moderate, long term on mine area | none |
| Reduction in water runoff and peak flows | Moderate, long term on mine area | none |
| Increased precipitation infiltration | Moderate, long term on mine area | none |
| Wildlife carrying capacity reduction | Moderate, possibly short term on mine area | none |
| Reduction in erosion | Moderate, long term on mine area | none |
| Enhanced vegetative productivity | Moderate, beneficial, long term on mine area | none |
| Potential acceleration of groundwater recharge | Moderate, long term on mine area | none |

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts[2] for the Proposed Action, and the No-Action Alternative for the P&M Exchange (Continued).

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **GEOLOGY AND MINERALS** | | |
| SUBSURFACE changes would result in: | | |
| Removal of coal | Moderate, permanent on mine area | none |
| Removal and replacement of topsoil and overburden | Moderate, long term on mine area | none |
| Physical characteristic alterations in geology | Moderate, permanent term on mine area | none |
| Loss of CBM[3] | None | none |
| **SOILS** | | |
| CHANGES IN PHYSICAL PROPERTIES would include: | | |
| Increased near-surface bulk density | Moderate, long term on mine area | none |
| More uniformity in soil type, thickness, and texture | Moderate, beneficial, long term on mine area | none |
| Increased uniformity in mixed soils (e.g., texture) | Moderate, beneficial, long term on mine area | none |
| Decreased soil loss due to topographic modification | Moderate, beneficial, long term on mine area | none |
| CHANGES IN CHEMICAL PROPERTIES would include: | | |
| Uniform soil nutrient distribution | Moderate, beneficial, long term on mine area | none |
| CHANGES IN BIOLOGICAL PROPERTIES would include: | | |
| Organic matter reduction | Moderate, long term on mine area | none |
| Microorganism population reduction | Moderate, long term on mine area | none |
| Existing plant habitat reduction in soils stockpiled before placement | Moderate, long term on mine area | none |
| **AIR QUALITY** | | |
| IMPACTS ASSOCIATED WITH MINING OPERATIONS would include: | | |
| Elevated concentration levels of TSP | Moderate, short term on mine area | none |
| Elevated concentrations of gaseous emissions | Moderate, short term on mine area | none |
| **WATER RESOURCES** | | |
| SURFACE WATER | | |
| CHANGES IN RUNOFF CHARACTERISTICS AND SEDIMENT DISCHARGE would include: | | |
| Disruption of surface drainage systems | Moderate, short term on mine area | none |
| Increased runoff and erosion rates | Moderate, short term on mine area | none |
| Increased infiltration | Moderate, long term on mine area | none |
| Reduction in peak flows | Moderate, long term on mine area | none |

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.
[3] Most of the CBM reserves could be recovered prior to initiation of mining activitiy, those reserves

Table 2-4 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts[2] for the Proposed Action, and the No-Action Alternative for the P&M Exchange (Continued).

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **WATER RESOURCES (continued)** | | |
| GROUNDWATER | | |
| IMPACTS ASSOCIATED WITH MINING OPERATIONS would include: | | |
| Removal of coal and overburden aquifers | Negligible, short term on mine area | none |
| Replacement of existing coal and overburden with spoil aquifers | Negligible, long term on mine area | none |
| Depressed water levels in aquifers adjacent to mines | Moderate, short term on mine area | none |
| Change in hydraulic properties | Negligible, long term on mine area | none |
| Change in groundwater quality in backfilled areas | Moderate, long term on mine area | none |
| **ALLUVIAL VALLEY FLOORS** | | |
| While a final determination has not been made by WDEQ/LQD, it is believed that proposed mining operations would not affect AVFs significant to agriculture | No impact to AVFs significant to farming on proposed mine area. AVFs not significant to farming would be restored if affected. | none |
| **WETLANDS** | | |
| Removal of all existing wetlands | Wetlands on disturbed areas would be mined and reclaimed | none |
| **VEGETATION** | | |
| PROGRESSIVE REDUCTION IN NATIVE VEGETATION would result in: | | |
| Increased erosion | Moderate, short term on mine area | none |
| Wildlife and livestock habitat loss | Moderate, short term on mine area | none |
| Wildlife habitat carrying capacity loss | Moderate, long term on mine area | none |
| AFTER RECLAMATION the following could result: | | |
| Changes in vegetation patterns | Negligible, long term on mine area | none |
| Reduction in vegetation diversity | Negligible, long term on mine area | none |
| Reduction in shrub density | Negligible, long term on mine area | none |

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-4 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts[2] for the Proposed Action, and the No-Action Alternative for the P&M Exchange (Continued).

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **WILDLIFE** | | |
| DURING MINING the following could occur: | | |
| Wildlife displacement | Moderate, short term on mine area | none |
| Pronghorn passage reduction | Moderate, short term on mine area | none |
| Increased mortality rate to small mammals | Moderate, short term on mine area | none |
| Temporary displacement of small mammals | Moderate, short term on mine area | none |
| Sage grouse habitat removal | Negligible, short term on mine area | none |
| Abandonment of raptor nests | Negligible, short term on mine area | none |
| Foraging habitat reduction for raptors | Negligible, short term on mine area | none |
| Loss of nesting and foraging habitat for MBHFI | Negligible, short term on mine area | none |
| Reduction in waterfowl resting and feeding habitat | Negligible, short term on mine area | none |
| Loss of songbird foraging habitat | Moderate, short term on mine area | none |
| Temporary wildlife habitat loss | Negligible, short term on mine area | none |
| Continued road kills by mine-related traffic | Negligible, short term on mine area | none |
| **THREATENED, ENDANGERED AND CANDIDATE SPECIES** | | |
| MINING IMPACTS could result in: | | |
| Loss of black-footed ferret colonies | No impacts on mine area | none |
| Loss of bald eagle nesting and foraging habitat | Negligible, short term on mine area | none |
| Loss of Ute Ladies-tresses orchid habitat | Negligible on mine area | none |
| Loss of mountain plover habitat | None | none |
| Loss of black-tailed prairie dog colonies | Colonies within mine disturbance area would be destroyed by mining | none |
| **LAND USE AND RECREATION** | | |
| ENVIRONMENTAL CONSEQUENCES ON LAND USE would be: | | |
| Reduction of livestock grazing | Moderate, short term on mine area | none |
| Loss of wildlife habitat | Moderate, short term on mine area | none |
| Curtailment of oil and gas development | Moderate, short term on mine area | none |
| Loss of public land available for recreation activities[3] | Negligible, short term on mine area | none |
| Loss of CBM reserves[4] | Moderate, permanent on mine area | none |
| **CULTURAL RESOURCES** | | |
| 19 sites not eligible or recommended not eligible for NRHP | Impacts to eligible or unevaluated sites are not permitted; any site eligible for the NRHP would be avoided or mitigated through data recovery | none |
| 2 recommended eligible for NRHP | | none |
| Possible increase in vandalism | No impacts on mine area | none |
| Possible increase in unauthorized collecting | No impacts on mine area | none |

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.
[3] Lands to be mined are all privately owned. The exchange would bring 6,068 privately owned acres into public ownership.
[4] Most of the CBM reserves could be recovered prior to initiation of mining activity, those reserves not recovered prior to mining would be lost.

Table 2-4 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts[2] for the Proposed Action, and the No-Action Alternative for the P&M Exchange (Continued).

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **NATIVE AMERICAN CONCERNS** | No impact identified on mine area | none |
| **PALEONTOLOGICAL RESOURCES** | | |
| Overburden removal could expose fossils for scientific examination | No impact identified on mine area | none |
| **VISUAL RESOURCES** | | |
| EVIDENT IMPACTS DURING MINING would include: | | |
| Alteration of landscape classified by the BLM as VRM Class II | Negligible, short term on mine area | none |
| IMPACTS FOLLOWING RECLAMATION could be: | | |
| Smoother sloped terrain | Negligible, long term on mine area | none |
| Reduction in sagebrush density | Negligible, short term on mine area | none |
| **NOISE** | | |
| INCREASED NOISE LEVELS could affect: | | |
| Nearby occupied dwellings | Negligible, short term on mine area | none |
| Wildlife in immediate vicinity | Negligible, short term on mine area | none |
| **TRANSPORTATION FACILITIES** | | |
| Increase in coal shipped on existing railroads | Negligible, short term on mine area | none |
| New employees travel on highways for duration of mining operations | Negligible, short term on mine area | none |
| Relocation of pipelines | Potential moderate, short term on mine area if CBM developed prior to mining | none |
| Relocation of utility lines | No impact on mine area | none |
| **SOCIOECONOMICS** | | |
| EFFECTS DURING MINING would include: | | |
| Employment Potential (Up to 70 jobs in mine area is expected) | Moderate, beneficial short term on mine area | none |
| Revenues from royalties and taxes to the state government | Moderate, beneficial short term on mine area | none |
| Revenues from royalties and taxes to the federal government | No impact on mine area | none |
| Economic development | Moderate, beneficial short term on mine area | none |
| Population in Sheridan County | No impact on mine area | none |

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-5. Summary Comparison of Magnitude and Duration of Cumulative Impacts.[1, 2]

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE TYPE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **TOPOGRAPHY & PHYSIOGRAPHY** | | |
| REDUCED RELIEF AND SUBDUED TOPOGRAPHY could result in: | | |
| Reduction in topographic diversity | Negligible, long term on mine areas | none |
| Increased precipitation infiltration | Negligible, long term on mine areas | none |
| Biodiversity reduction | Negligible, long term on mine areas | none |
| Big game carrying capacity reduction | Negligible, long term on mine areas | none |
| **GEOLOGY AND MINERALS** | | |
| RECOVERY OF COAL would result in: | | |
| Stabilization of municipal, county and state economies | Significant, beneficial, short term on mine areas | none |
| **SOILS** | | |
| RECLAIMED SOILS could result in: | | |
| Increased soil productivity | Negligible, long term on mine areas | none |
| Reduced erosion | Negligible, long term on mine areas | none |
| **AIR QUALITY** | | |
| IMPACTS ASSOCIATED WITH MINING OPERATIONS would include: | | |
| Elevated concentration levels of TSP | Negligible, short term on mine areas | none |
| Elevated concentrations of gaseous emissions | Negligible, short term on mine areas | none |
| **WATER RESOURCES** | | |
| SURFACE WATER | | |
| IMPACTS TO SURFACE WATER could result in: | | |
| Temporary reduction in soil infiltration rates and increased runoff | Negligible, short term on mine areas | none |
| GROUNDWATER | | |
| IMPACTS ON GROUNDWATER could result in: | | |
| Replacing coal aquifers with spoil aquifer | Negligible, long term on mine areas | none |
| Drawdown in the coal and alluvial aquifers in surrounding areas | Negligible, short term on mine areas | none |
| Water-level decline in the sub-Dietz 3 coal aquifers | Negligible to moderate, short term on mine areas | none |
| Change in groundwater quality as a result of mining | Negligible, long term on mine areas | none |
| **ALLUVIAL VALLEY FLOORS** | No cumulative impacts anticipated on mine areas | none |
| **WETLANDS** | | |
| Removal of existing wetlands | Wetlands on mine areas would be mined and reclaimed | none |

[1] Refer to Section 4.8 for a discussion of cumulative impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-5 Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued)

| *DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE* | *MAGNITUDE TYPE AND DURATION OF IMPACT* | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **VEGETATION** | | |
| SURFACE DISTURBANCE would result in: | | |
| Loss of common native vegetation types for wildlife | Negligible, short term on mine areas | none |
| Regional loss of vegetative diversity | Negligible, long term on mine areas | none |
| **WILDLIFE** | | |
| IMPACTS ON WILDLIFE FROM SURFACE MINING could result in: | | |
| Loss of pronghorn habitat | Moderate, short term on mine areas | none |
| Mule deer and white tail deer population reduction | Negligible, short term on mine areas | none |
| Reduction in raptor nesting sites and foraging habitat | Negligible, short term on mine areas | none |
| Reduction in sage grouse leks | Negligible, short term on mine areas | none |
| Loss of nesting and foraging habitat for MBHFI | Negligible, short term on mine areas | none |
| Reduction in waterfowl habitat | Minor, short term on mine areas | none |
| Permanent reduction in wildlife habitat diversity | Major, long term on mine areas | none |
| Permanent reduction in some wildlife carrying capacity | Major, long term on mine areas | none |
| **THREATENED, ENDANGERED AND CANDIDATE SPECIES** | | |
| No significant cumulative impacts to T&E species are projected | Negligible, short term on mine areas | none |
| **LAND USE AND RECREATION** | | |
| IMPACTS ON LAND USE could result in: | | |
| Loss of agricultural production | Moderate, short term on mine areas | none |
| Disruption of oil and gas development/production | Moderate to significant, short term on mine areas | none |
| Reduction of wildlife habitat | Moderate, short term on mine areas | none |
| IMPACTS ON RECREATION could result in: | | |
| Loss of access to lands used by recreationists, particularly hunting | Moderate, short term on mine areas | none |
| **CULTURAL RESOURCES** | Sites eligible for NRHP would be mitigated on mine areas | none |
| **NATIVE AMERICAN CONCERNS** | No impact identified on mine areas | none |
| **PALEONTOLOGICAL RESOURCES** | No impact identified on mine areas | none |
| **VISUAL RESOURCES** | | |
| Impacts on visual resources by mining activities | Moderate, short term on mine areas | none |
| **NOISE** | No impact anticipated outside of mine areas | none |

[1] Refer to Section 4.8 for a discussion of cumulative impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-5 Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued)

| ***DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE*** | ***MAGNITUDE TYPE AND DURATION OF IMPACT*** | |
|---|---|---|
| **RESOURCE NAME** | **PROPOSED ACTION** | **NO ACTION ALTERNATIVE** |
| **TRANSPORTATION FACILITIES** | | |
| Continued use of existing transportation facilities | Negligible, short term on mine area | none |
| **SOCIOECONOMICS** | | |
| IMPACTS ON SOCIOECONOMICS could include: | | |
| Mineral and energy related development | Moderate, beneficial, short term on mine areas | none |
| Employment | Significant, beneficial, short term on mine areas | none |
| Housing market | Significant, short term due to mines | none |
| Economic development | Significant, beneficial, short term due to mine areas | none |
| Revenues and royalties | Significant, beneficial, short term due to mine areas | none |

[1] Refer to Section 4.8 for a discussion of cumulative impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

# 3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources of the lands involved in the proposed exchange. The resources that have been identified on the lands that BLM[1] would acquire are summarized in Sections 3.1, 3.2, and 3.3. The resources on the PSO Tract that could be affected by mining operations are described in Section 3.4. The resources that are addressed here were identified during the scoping process or interdisciplinary team review as having the potential to be affected.

Critical elements of the human environment (BLM 1988) that could potentially be affected by the proposed action include air quality, cultural resources, Native American religious concerns, T&E species, hazardous or solid wastes, water quality, wetlands/riparian zones, invasive non-native species, environmental justice, and areas of critical environmental concern. T&E species are addressed in Appendix C. Prime or unique farmlands, floodplains, wild and scenic rivers, and wilderness are not present in the project areas and are not addressed further.

## 3.1 Bridger Lands

The Bridger lands, located in east-central Lincoln County, Wyoming, are comprised of nine distinct tracts (Figures 1-1 and 1-2). These nine tracts include approximately 3,086 acres within and adjacent to the southern end of the BTNF. There are seven western tracts and two eastern tracts. As shown in Figure 1-2, the western tracts and part of one of the eastern tracts are inside the BTNF. As discussed in Chapter 1, USFS would administer the lands inside the BTNF and the BLM would administer the lands outside the BTNF if an exchange is completed. Additional information about the Bridger Tract is included in Appendix D.

Topography and Physiography

The Bridger lands occupy a portion of the southern end of the Idaho/Wyoming overthrust belt physiographic province. The dominant landforms in the region are northerly trending ridges and valleys which are subparallel to major and minor thrust fault traces. The eastern tracts occupy a portion of Mahogany Ridge.

Geology and Mineral Resources

Significant oil and gas reserves are present in the overthrust belt. WOGCC records indicate there has been no oil and gas test drilling on the property. Coal deposits are also present in this area. The two eastern tracts are located along or near Mahogany Ridge, which is underlain by coal and lignite in the lower part of the Upper Cretaceous Frontier Formation. No coal mining activities have occurred on the Bridger lands. Coal production from Lincoln County

[1] Refer to page viii for a list of abbreviations and acronyms used in this document.

has been largely from a surface mine located approximately 20 miles south of the Bridger property.

Water Resources

The western Bridger lands are located along tributaries to the Hams Fork, a south-flowing tributary of the Green River. The eastern tracts are located along tributaries of Fontenelle Creek, an eastward flowing tributary of the Green River. Perennial and ephemeral streams flow through portions of many of the Bridger lands.

There are no known wetlands on the Bridger lands; however, riparian habitat is present on several of the tracts.

Soils

The western Bridger lands are characterized by soils that are high in clay and are subject to compaction and to accelerated erosion when disturbed. According to USFS information, the majority of the soils in the Bridger lands are considered to be "sensitive ground," which implies soils with a high erosion and compaction hazard and severe revegetation limitations.

Vegetation

The western Bridger lands are predominantly forested with mixed aspen-conifer species. The major vegetation types on these tracts include lodgepole pine, sagebrush, mountain mahogany, aspen, and willow. Lodgepole pine is the dominant tree species. In this area, lodgepole pine occurs in patches which may range in size from a few acres up to several thousand acres but are more typically several hundred acres in size. The lodgepole pine patches are broken up across the landscape by riparian areas dominated by willow; open sagebrush/grass areas and parks; wide bare ridgelines; aspen patches and stringers; and spruce-fir forested areas.

The two eastern tracts are generally unimproved rangeland. On these eastern tracts, vegetation includes mountain big sage, lodgepole pine, mountain mahogany, and grasses.

See Appendix C for discussion of threatened, endangered, and sensitive plant species that have been identified as potentially present by the USFWS.

Wildlife

The Bridger lands proposed for BLM acquisition (the eastern tracts) include designated elk parturition and transition range, mule deer winter and yearlong range, and moose yearlong and crucial winter range.

The Bridger lands proposed for USFS acquisition (western tracts and a portion of one eastern tract) provide habitat for many wildlife species. Species present include small animals such as hares, grouse, beavers, neo-tropical migrant birds, and coyotes. Harvested animals such as elk, deer, moose, mountain lions and black bears are present as well as a number of threatened,

endangered, and sensitive species. The USFS Bridger tracts serve as summer, winter, and parturition range for these species and also contain important migration corridors between summer and winter ranges.

The USFS Bridger tracts include spring, summer, and fall range for a portion of the West Green River elk herd and important travel corridors between summer and winter range. This elk herd does not rely on permanent feedgrounds to sustain the population during winter months, although the elk have been fed on an emergency basis during severe winters. This area is still relatively remote. The western tracts lie within a "security" range extending along Commissary Ridge. By definition, elk security habitat must be more than one half mile from roads and at least 250 or more contiguous acres.

The USFS Bridger tracts provide parturition and crucial winter range as well as spring, summer, and fall range for the Lincoln moose herd, one of the largest moose populations in the state. Moose in this herd unit utilize a variety of plant communities that are found on the USFS Bridger tracts.

The USFS Bridger tracts provide spring, summer and fall range for the Wyoming Range mule deer herd, the largest mule deer herd in the state.

Colorado River Cutthroat trout are known or suspected to occupy the streams within many of the Bridger lands.

See Appendix C for discussion of threatened, endangered, and sensitive wildlife species that have been identified as potentially present by the USFWS.

Land Use

The rugged nature of this portion of the Wyoming Range has prevented most commercial development. Five of the seven western tracts (inside the BTNF) have recently been or are currently being logged to recover marketable timber. Recent forest fires have encroached near the tracts and fire fighting crews have used available roads for access.

The eastern tracts are largely undisturbed and unimproved native rangeland, which are used for livestock grazing. The Bridger lands outside the BTNF, which BLM would acquire, include a total of 118 AUMs These lands are unfenced from the South LaBarge Common allotment, and the BLM Pinedale Field Office credits the grazing permittee for inclusion of these private AUMs into the grazing permit.

Public lands (USFS or BLM) surround all of the Bridger lands; therefore, public recreation has been a major use of the Bridger lands in recent years. All of the tracts have been used for hunting and, where appropriate, for fishing activities. Several of the tracts include many sites suitable for dispersed camping. Other recreational uses include hiking, wildlife observation, off-road vehicle use and photography.

Transportation

The Bridger lands are accessed by two principal roads. The eastern tracts, located along Mahogany Ridge and Fontenelle Creek, are reached by improved aggregate-surfaced roads leading north from U.S. Highway 189 north of Kemmerer and generally up Fontenelle Creek. An unimproved two-track jeep trail crosses the southern-most tract; however, access across Fontenelle Creek is limited. Access to the western tracts is by way of an improved county road that follows the Hams Fork upstream to the Hams Fork Campground. The Hams Fork Campground is located about one mile west of the nearest tract. Jeep trails to some of the tracts from the main road have recently been improved for the purpose of supporting logging operations currently underway on several of the tracts.

Cultural Resources

No formal cultural resources inventory is known for the Bridger lands outside the BTNF (proposed for BLM acquisition). Mahogany Ridge is a hogsback uplift containing numerous rock outcrops and ledges which might hold prehistoric rock shelters, but none are known. Burnt Bend on Fontenelle Creek may contain historic period resources, as numerous cabins, line shacks and other stock maintenance locales are found on adjacent and similar portions of Fontenelle Creek, Coal Creek and Rock Creek. Similarly, prehistoric camp sites are expected on the terraces of Fontenelle Creek, preserved in the alluvial soils found there. Overall, however, the project area is one of low to moderate cultural resource potential.

No historic or prehistoric sites are known to exist on any of the western parcels (inside the BTNF). The USFS Kemmerer District has 49 recorded Heritage resources sites. Of these, 25 are prehistoric and the remaining 24 are historic. Most of the prehistoric sites are small lithic scatters indicative of temporary campsites utilized by nomadic hunters and gatherers. Artifacts recovered from these sites suggest that most of them date to the last 3,000 years; however, one site contained material suggesting an age of over 8,000 years.

Native American Consultation

The Mahogany Site, a prehistoric pictograph site of reported Ute affinity, is located a few miles from the eastern tracts. This site is a rare and significant rock art locality and is considered an important site to modern day Native Americans (the Shoshone and Ute, specifically). While no sites of interest to or considered sensitive by modern Tribal individuals are known for any of the lands proposed for acquisition, consultation and/or site visits have not been conducted. Thus, it would be premature to rule out the presence of localities considered important to modern Tribal interests.

## 3.2 JO Ranch Lands

The JO Ranch property, located in southwest Carbon County, Wyoming,

includes approximately 1,236.5 acres that are primarily along the valley floor of Cow Creek (Figures 1-1 and 1-3).

Topography and Physiography

Cow Creek and its tributaries drain the west foothills of the Sierra Madre Mountains. West of Cow Creek, the area is described as gently rolling topography. To the east of Cow Creek the slopes rise gradually upward forming the deeply dissected foothills of the Sierra Madre Mountains.

Geology and Mineral Resources

The JO Ranch lands are located in the Washakie Basin, which contains oil and gas reserves. There are actively producing conventional oil and gas wells in the vicinity of the JO Ranch lands but, according to WOGCC records, there are currently no producing conventional oil and gas wells on the lands proposed for exchange. Portions of the JO Ranch lands are underlain by coal beds. The coal in this area is not economically mineable and there are no operating coal mines in this area. CBM exploration is presently occurring, however, and some of the proposed development is in the area of the lands proposed for exchange. A CBM EIS is in preparation for this area. One CBM test well was drilled in 1999 on one 40-acre lot included in the exchange proposal; however, there is no record of any production from that well.

Water Resources

Cow Creek is a southwest-flowing ephemeral drainage (Figure 1-3). Cow Creek and its tributaries drain the west foothills of the Sierra Madre Mountains. Cow Creek joins Muddy Creek, a tributary of the Little Snake River, about one mile southwest of the JO Ranch lands.

Vegetation

The bottom lands along Cow Creek are mostly a riparian-grassland habitat type, dominated by Nebraska sedge, beaked sedge, tufted hairgrass, redtop, Kentucky bluegrass and a variety of forbs. At the upper end of the creek there are willows and waterbirch. The uplands consist of Wyoming big sagebrush and mixed grass habitat types, with local areas along the west boundary containing a high percentage of bitterbrush. The northern portion of the JO Ranch lands lies at the edge of the Sand Hills (see Figure 1-3), which contain a mixture of shrubs including silver sagebrush, basin big sagebrush, Douglas and rubber rabbitbrush, bitterbrush, rose, serviceberry, snowberry, and chokecherry. Needle-and-thread grass and prairie sandreed are the dominant grasses along with other grasses and forbs. The overall condition of these plant communities is good. Thistles may be present in the meadow habitat, but no noxious plant species are known to occur in this area. Both the riparian and sand hillls plant communities are important in terms of the plant and animal life they

support and neither are very common in terms of total acreage in this area.

See Appendix C for discussion of threatened, endangered, and sensitive plant species that may be affected by the exchange.

Wildlife

The portion of Cow Creek included in the exchange proposal has live water and is considered a willow riparian/meadow grassland type of habitat. The northern portions of the JO Ranch lands fall within the area that is known as the Sand Hills which is a unique upland habitat.

The JO Ranch lands include both mule deer and elk crucial winter range. This area is part of the Baggs Elk Crucial Winter Range Management Area.

The area falls within the 2-mile buffer of ten greater sage grouse leks, but no leks have been identified on the JO Ranch lands. This area is considered good nesting and brood rearing habitat for greater sage grouse. The area may be important to Columbia sharp-tailed grouse since these birds are expanding their range into areas adjacent to these parcels. No raptors have been identified on the lands proposed for exchange, but several historical ferruginous and golden eagle nests have been identified within ¼ mile.

The portion of Cow Creek included in the exchange proposal could include habitat for non-game BLM sensitive fish species such as roundtail chubs, flannelmouth suckers, and bluehead suckers.

See Appendix C for discussion of threatened, endangered, and sensitive wildlife species that may be affected by the exchange.

Land Use

Livestock production, both cattle and sheep, and supplemental hay production for winter feed have historically been and remain the principal uses of the JO Ranch lands. Currently the property is leased for the purpose of cattle grazing. The lands immediately adjacent to and surrounding the JO Ranch property are federal or state surface and have also historically been used primarily for sheep and cattle production.

The JO Ranch lands are generally unimproved. Recreational uses of the JO Ranch lands are primarily associated with pronghorn antelope, mule deer, elk and sage grouse hunting. The extensive public lands surrounding the JO Ranch property are readily accessible and therefore important to hunters. Other than fall hunting activity, the area attracts limited numbers of recreationists engaged in back county camping and hiking, rock hounding, wildlife observation, off-road vehicle use, outdoor photography, and scenic touring.

Cultural

The JO Ranch lands include the JO Ranch or Rankin Ranch buildings, which are a collection of stone

buildings that date from the late 1800s. These buildings are eligible for National Historic Site status.

Native American Consultation

No sites of interest to or considered sensitive by modern Tribal individuals are known for the lands proposed for acquisition. Consultation and/or site visits have not been conducted.

Transportation

The property is accessed by improved aggregate-surfaced roads off of Wyoming State Highway 789 approximately 20 miles north of Baggs, Wyoming. There are numerous two-track ranch roads located throughout the property.

## 3.3 Welch Lands

The Welch lands, located in north-central Sheridan County, Wyoming, comprise approximately 1,600 acres (Figures 1-1, 1-4). The Welch lands are located in the PRB, a part of the Northern Great Plains which includes most of northeastern Wyoming and a portion of southeastern Montana. The Big Horn Mountains are within sight of the Welch lands to the west. The Welch lands are located in the same general area as the federal coal lands that P&M proposes to acquire in Sheridan County, which are referred to as the PSO Tract in this EIS and are described below in Section 3-4 (see Figure 3-1).

Topography and Physiography

The Welch lands occupy a portion of the Tongue River valley floor and the adjacent dissected uplands between Ash Creek and Hidden Water Creek, both tributaries of the Tongue River (Figure 1-4).

Geology and Mineral Resources

The Welch lands are underlain by coal. There is a long history of coal mining activities in the Sheridan coal field. Coal was mined extensively from numerous underground mines that were located primarily along the Tongue River upstream of the Welch lands. Underground coal mining began in the late 1800s and continued into the 1940s. Many square miles of room and pillar underground mine workings extend on both sides of the confluence of Goose Creek with the Tongue River, located about three miles south-southwest of the Welch lands. The closest underground mine, the Acme Mine No. 42, extends beneath a portion of the Welch lands. Maps of this mine that were prepared in 1922 show the approximate extent of mining at that time. According to the book 'Black Diamonds of Sheridan' (Kuzara 1977), mining in the Acme Mine No. 42 continued until about 1942, which suggests the potential existence of underground mine workings on the Welch lands beyond the limits mapped in 1922. The underground mines in this area were all closed and sealed off by 1953, following the railroad's conversion from coal to petroleum fuel and the advent of surface coal mining.

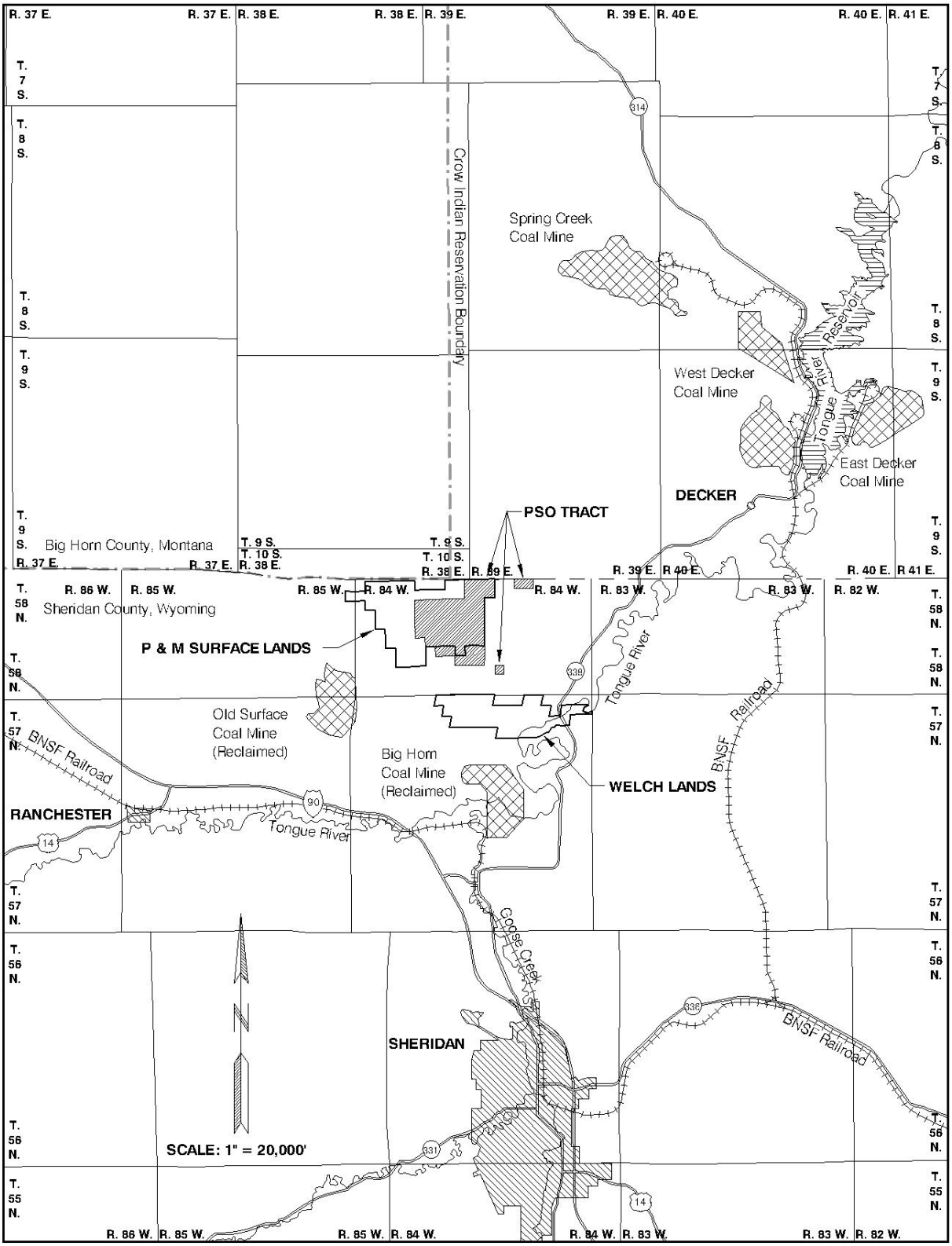



Figure 3-1. General Analysis Area.

Roof collapses over the closed Acme Mine No. 42 led to the development of underground coal fires. One such fire, which was located south of and immediately adjacent to the Welch lands, continued for many years. In 1987, under the direction of the Abandoned Mine Lands Reclamation Program, the fires were extinguished by smothering with earthen material and the disturbance area of approximately 90 acres was reclaimed. Spontaneous coal fires still occur along outcrops adjacent to the Tongue River within the Welch lands, specifically in the southwest portion of T.58N., R.84W., Section 2 (WWC 2001).

P&M acquired its ownership in the Welch lands in October 1998. The previous owners obtained a permit to mine coal in a portion of the Welch lands in 1979 and began stripping topsoil to access shallow coal reserves on the property. A short haul road was also constructed. Plans to mine the area were canceled and, because minor surface disturbance had occurred and mining was not anticipated in the foreseeable future, the disturbed area was reclaimed under the direction of WDEQ in 1999. Currently there are no active surface coal mines in Sheridan County, although large-scale surface mining is being conducted approximately eight miles northeast of the Welch lands in Montana. In the past few years CBM has been developed in this area (Refer to Section 3.4.3 for additional discussion of CBM development in this area).

Water Resources

Approximately 1.5 miles of the Tongue River runs through the eastern portion of the Welch lands. The river and riparian area lie within an alluvial valley floor.

Soils

The soils in the area are dominated by very deep soils on the flood plains, low terraces, and alluvial fans. The soil association is described as a Haverdad-Ziegweid-Nuncho.

Vegetation

The vegetation along the portion of the Tongue River that runs through the eastern portion of the Welch lands includes late seral cottonwood, green ash and chokecherry. This riparian area is in proper functioning condition. The meadows along the river are irrigated under a territorial water right for hay production. The river and riparian area lie within an alluvial valley floor which contains the highest diversity of vegetation and wildlife on the Welch lands and is in pristine condition.

The upland areas on the property contain sagebrush/grasslands intermixed with skunkbush sumac and ponderosa pine and juniper stands. Several draws contain green ash, chokecherry and hawthorne shrubs. A large portion of the upland woodlands was burned in a July 2001 wildfire.

See Appendix C for discussion of the occurrence of threatened,

endangered, and sensitive plant species potentially present on the Welch lands

Wildlife

Wildlife typically present on the Welch lands include antelope, mule deer, white-tailed deer, coyote, fox, sage grouse, sharp-tail grouse, turkey, grey partridge, pheasant, waterfowl, golden eagle, red-tailed hawk, turkey vulture, and numerous non-game birds and mammals. Other species observed or known to frequent the Welch lands include bald eagle, cormorant, blue heron, mountain lion, bobcat and elk.

The Tongue River along this stretch is a transition zone between cold-water and warm-water fish species and contains small-mouth bass, sauger, walleye, catfish, brown trout, and numerous non-game species.

See Appendix C for discussion of the occurrence of threatened, endangered, and sensitive wildlife species potentially present on the Welch lands.

Ownership and Use of Land

The surface of the Welch lands is owned by P&M, the oil and gas estate is privately owned, and the coal ownership is private (owned by P&M) and unleased federal. P&M surface and coal estate rights are included in the exchange proposal.

The property consists predominantly of unimproved rangeland, scattered pine and juniper forests in deep drainages, and hay croplands typical of a flood and subirrigated alluvial valley floor. Historically, the property has been used principally for livestock grazing, with crop production concentrated along portions of the valley floor of the Tongue River. Since the property was settled in the early 1900s, grazing practices have been relatively unchanged. The current surface leaseholder grazes a small number of cattle in the area.

Currently, development and associated disturbance on the property are limited to an irrigation ditch, a diversion dam, fences, utility easements, a reclaimed gravel pit, reclaimed surface mine operations (described in the section on Geology and Mineral Resources), and unimproved dirt roads and trails.

Recreational opportunities on the lands include big game and game bird hunting (both upland and waterfowl) and sport fishing. The Tongue River valley offers a greater diversity of game bird habitat than is found on the adjacent lands, and the Tongue River in this area is a good small-mouth bass fishery resource. White-tailed deer hunters may also experience success on the Welch lands because the denser riparian vegetation within the Tongue River valley is a habitat that is preferred by the deer. In addition, the two-track ranch roads and trails that traverse the property provide access for other outdoor activities such as hiking, biking and photography.

The federal coal included in the lands proposed for exchange is unleased. The oil and gas estate is privately owned. There has been no oil and gas exploration or development on the Welch lands; however, CBM wells have been drilled in the area and CBM could potentially be developed on the Welch lands.

Cultural Resources

The Welch lands have been inventoried at the Class III level, a number of sites have been tested, and 44 sites are recorded, including 27 lithic scatters, 2 quarries, 6 camps or occupations, 3 historic homesteads or structural remains, 1 wagon mine, 1 historic bridge, and 2 prehistoric lithic scatters associated with sheepherder's monuments or historic cairns. The Welch lands are located adjacent to Tongue River and close to the Thunderchild Rehabilitation Center.

Native American Consultation

None of the inventoried sites included in the Welch lands are known to be of interest to or considered sensitive by modern Tribal individuals. Consultation and/or site visits have not been conducted.

Transportation

The Welch lands can be accessed from Sheridan via Wyoming State Highway 338 (Figure 1-4). Several unimproved two-track ranch roads serve the property both from Highway 338 and from the Ash Creek Road located just north of the property.

## 3.4 PSO Tract

The following paragraphs describe the resources present on the PSO Tract. PSO would acquire the federal coal underlying the PSO Tract if the exchange is completed. The resources present on the PSO Tract are described in some detail because P&M proposes to mine the coal under these lands if the exchange is completed. Because of the proximity of the PSO Tract to the Welch lands, there are many similarities in the affected environment for both tracts (Figure 3-1).

### 3.4.1 General Setting

The PSO Tract, like the Welch lands, is located in the PRB, a part of the Northern Great Plains which includes most of northeastern Wyoming and a large portion of southeastern Montana. Vegetation is primarily sagebrush, mixed prairie grass, and ponderosa pine with a shrub understory. The climate is semi-arid and characterized by cold winters, warm summers and a large variation in annual and seasonal temperature and precipitation. Wind, precipitation, and temperature patterns in the study area are significantly affected by the Big Horn Mountain range, which is within sight of the project area to the west.

The average annual precipitation at Sheridan (Figure 3-1) for the period of record 1920-2000 is just over 15 inches (WRCC 2001). The annual precipitation records for the period of record 1949-1974 near the Decker Coal Mine (Figure 3-1) ranged from a

low of about 6.5 inches in 1960 to a high of about 17.6 inches in 1968, with an average of about 11.8 inches. About 45 percent of the annual precipitation falls in the 3-month period April through June. In Sheridan, June (2.79 inches) and May (2.54 inches) are the wettest months, and February (0.48 inch) is the driest. Nearly 30 percent of the annual precipitation falls as snow from October through March. Snowfall averages 44.8 inches per year, with most occurring in March (9.2 inches) and January (7.6 inches). The remainder of the annual precipitation generally occurs as summer thunderstorms, and most flooding in the area occurs in response to high-intensity thunderstorms of comparatively short duration. Potential evapotranspiration at approximately 22 inches (Martner 1986) exceeds annual precipitation.

The seasonal and daily variations between maximum and minimum temperatures are often extreme. Temperatures at Sheridan have historically ranged from 106°F to –37°F, while the temperatures in the Tongue River valley approximately 30 miles north of the project area have been recorded to range from 107° to –45°F. July is the warmest month, with a mean daily temperature of 69.6°F, and January is the coldest month with a mean daily temperature of 19°F. The frost-free period in Sheridan averages 125 days (WRCC 2001).

Winds are greatly affected by local topography. The prevailing winds recorded by the Decker Coal Mine come from the northwestern, southern and northeastern directions. Winds blowing from the western half of the compass are generally faster than winds blowing from the eastern half. The greatest percentage of fast winds come from the northwest quadrant. The average wind velocity recorded in Sheridan is about 8 miles per hour; however, velocities in excess of 25 miles per hour are common throughout the year. The fastest wind speed ever recorded at the Sheridan airport, 84 mph, was in November 1949. Hot, dry winds commonly blow during the summer and strong winds often accompany winter snow storms causing drifting.

General information describing the area's resources were gathered from draft BLM Buffalo Field Office planning documents (BLM 1996a, 1996b, 1996c, 1996d, 1996f) and a BLM coal leasing study (BLM 1996e).

### 3.4.2 Topography and Physiography

The PRB is an elongated, asymmetrical structural downfold. It is bounded by the Casper Arch, Laramie Mountains, and Hartville Uplift to the south; the Miles City Arch in Montana to the north, the Big Horn Mountains on the west, and the Black Hills on the east. The PSO Tract is located near the northwest limb of the structural basin, near the Tongue River valley and within sight of the Big Horn Mountains. The PRB landscape consists of broad plains, low hills, and tablelands. Generally, the topography changes from open hills with 500-1,000 ft of relief in the northern part of the PRB to plains

and tablelands with 300-500 ft of relief in the southern part. Playas are common in the basin, as are buttes and plateaus capped by clinker or sandstone.

The PSO Tract lies within the drainages of Ash Creek and Youngs Creek. These perennial streams are tributaries of the Tongue River, which lies about three miles east and four miles south of the project area. Most of the project area consists of the dissected uplands between Ash Creek and Little Youngs Creek, a perennial tributary of Youngs Creek (Figure 2-2). The tributaries of these streams have dissected numerous deep, steeply sloping ravines that are separated by relatively flat rounded uplands. The eastern portion of the proposed Ash Creek Mine area, which overlies privately-owned coal, is dominated by a broad valley occupied by Little Youngs Creek and its confluence with Youngs Creek (Figure 2-2). Slopes range from nearly flat to over 60 percent. Slopes on the uplands and valley bottoms are generally between one and ten percent, while the bedrock areas along the valley edges exhibit the steeper slopes. Slope analyses would be done for the proposed Ash Creek Mine permit application if the exchange is completed.

### 3.4.3 Geology

Stratigraphic units in the proposed Ash Creek Mine area that would be impacted if the exchange is completed and a mine is opened are, in descending order, recent (Quaternary age) alluvial and eolian deposits and the Paleocene age Fort Union Formation (which contains the target coal beds). Figure 3-2 shows two geologic cross-sections drawn through the proposed Ash Creek Mine area (one roughly north-south and one northeast-southwest). These cross sections are a basic representation of the geology in the vicinity of the PSO Tract. Figure 3-3 is a chart showing the stratigraphic relationships and hydrologic characteristics of the surface and subsurface geologic units in the area of the PSO Tract.

Surficial deposits in the analysis area include Quaternary alluvial, colluvial and eolian deposits, clinker, and weathered Fort Union Formation. There are alluvial deposits, consisting of floodplain, stream and terrace deposits, along the area's major drainages (Ash Creek, Youngs Creek, Little Youngs Creek, and West Branch Little Youngs Creek). In general, these alluvial sediments are composed of interbedded silts and clays overlying beds of sand and gravel. Unconsolidated materials that occupy the bottom of the Little Youngs Creek drainage have a maximum thickness of about 40 ft, including as much as 23 ft of interbedded sand and gravel, generally overlain by finer-grained materials (Hedges, et al. 1980). The gravel consists primarily of rounded to subrounded detrital clinker with a maximum particle size of approximately 2 inches in diameter (Ash Creek Mining Company 1984). Colluvium, sheetwash and residual deposits derived from the Fort Union

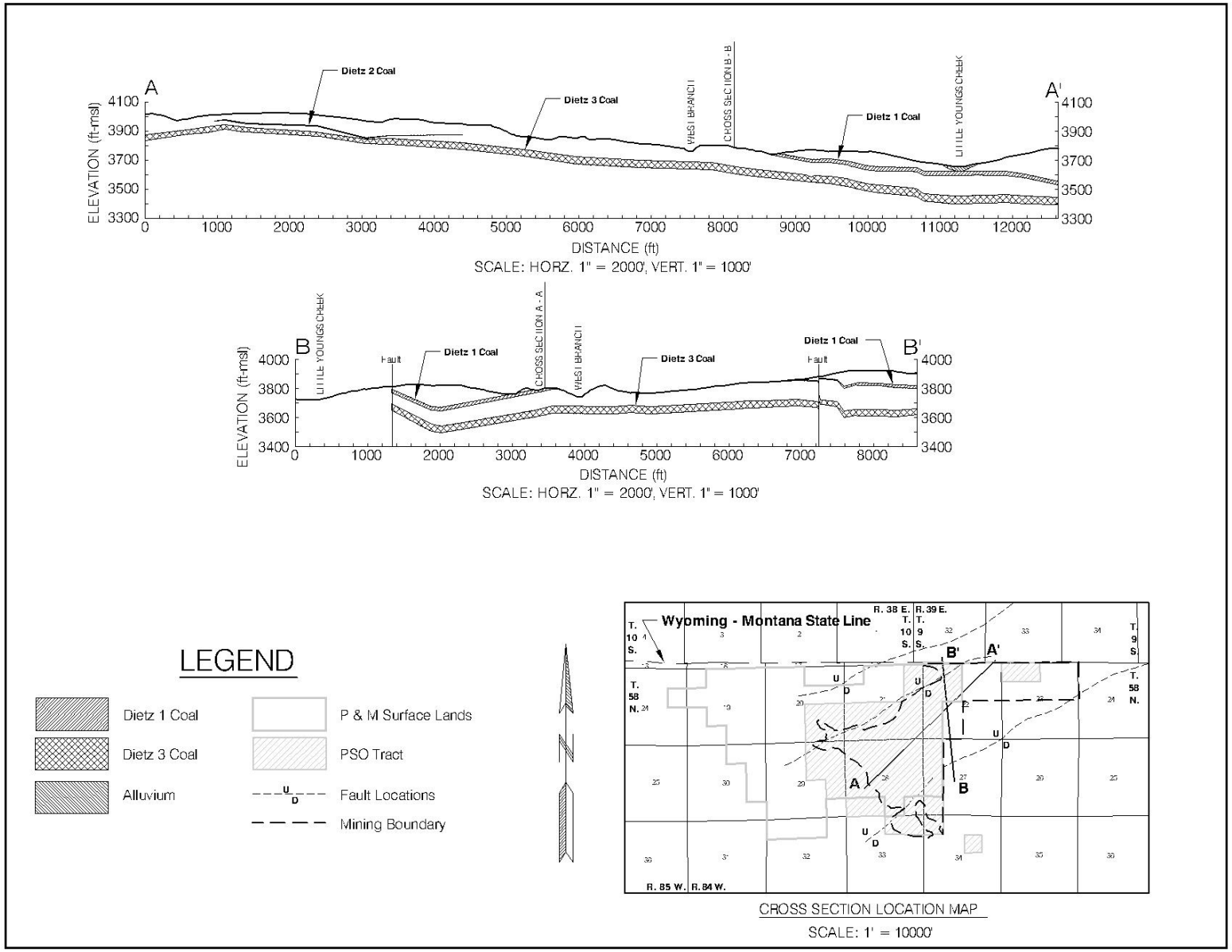



Figure 3-2. Geologic Cross Sections for the Ash Creek Mine.

| Geologic Unit | | Hydrologic Characteristics |
|---|---|---|
| **RECENT ALLUVIUM** HOLOCENE | | Typically fine grained and poorly sorted in intermittent drainages. Occasional very thin, clean interbedded sand lenses. Low yields and excessive dissolved solids generally make these aquifers unsuitable for domestic, agricultural and livestock usage. Low infiltration capacity unless covered by sandy eolian blanket. |
| **CLINKER** HOLOCENE TO PLEISTOCENE | | Baked and fused bedrock resulting from burning coal seams which ignite on the outcrop from lightning, manmade fires or spontaneous combustion. The reddish clinker (locally called scoria, red dog, etc.) formed by melting and partial fusing from the burning coal. The baked rock varies greatly in the degree of alteration; some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated. |
| **WASATCH FORMATION*** EOCENE | | Lenticular fine sands interbedded in predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand bodies result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch formation generally does not meet Wyoming Class I drinking water standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality which does meet the Class I standard. |
| **FORT UNION FORMATION** PALEOCENE | TONGUE RIVER MEMBER | The coal seams serve as regional groundwater aquifers and exhibit highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use. |
| | LEBO MEMBER | The Lebo Member, also referred to as "The Lebo Confining Layer" has a mean thickness of 711 feet in the PRB and a thickness of about 400 feet in the vicinity of Gillette (Lewis and Hotchkiss 1981). The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm (Lewis and Hotchkiss 1981). |
| | TULLOCK MEMBER | The Tullock Member has a mean thickness of 785 feet in the PRB and a mean sand content of 53 percent which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common but vary locally and may be as much as 40 gpm. Records from the SEO indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements. |
| **UPPER CRETACEOUS** | LANCE FORMATION | Sandstone and interbedded sandy shales and claystone provide yields generally of less than 20 gpm. Higher yields are sometimes achieved where sand thicknesses are greatest. Water quality is typically fair to good. |
| | FOX HILLS SANDSTONE | Sandstone and sandy shales yield up to 200 gpm, however, yields are frequently significantly less. The water quality of the Fox Hills is generally good with TDS concentrations commonly less than 1000 mg/l. |
| | PIERRE SHALE | This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions in solution. |
| * Not present in the general area of the PSO lands. | | |

Figure 3-3. Stratigraphic Relationships and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary, and Recent Geologic Units, Powder River Basin, Wyoming. (Compiled from Hodson et al. 1973 and Lewis and Hotchkiss 1981).

Formation bedrock occur on the uplands and slopes.

The Eocene age Wasatch Formation is not present within the PSO Tract area.

The Fort Union Formation is approximately 3,400 ft thick in this vicinity and consists primarily of interbedded shales, mudstones, siltstones, lenticular sandstones, and coal. It is divided into three members: Tongue River (which contains the target coal seams), Lebo, and Tullock, in descending order (Figure 3-3).

The Tongue River Member consists of interbedded claystone, silty shale, carbonaceous shale and coal, with lesser amounts of fine-grained sandstone and siltstone. The clastic beds of the Tongue River Member were deposited on floodplains of large rivers, in river and stream channels, or on deltas extending outward into swamps. The clastic beds tend to be lenticular in shape and of limited areal extent. As a result, the lithology of the strata often changes rapidly over short distances, making it difficult to characterize the exact lithology of the overburden or interburden for any great lateral distances.

The Fort Union coal seams of mineable depth and thickness in the PSO Tract area include, in descending order, the Anderson and Dietz coal seams. The Anderson and Dietz seams are correlatable over a broad area. At the Decker Coal Mine, they are mined as the D1 and D2 seams. At the Big Horn Coal Mine the Dietz seam is correlatable with the Dietz 2 and Dietz 3 coals. The Anderson is stratigraphically higher than the mining disturbance at the Big Horn Coal Mine and generally occurs only as isolated remnants south and west of the PSO Tract (Ash Creek Mining Company 1984). Within the general Monarch, Wyoming and Decker, Montana area the Fort Union coal seam nomenclature varies with respect to location and/or author (Law, et al. 1979). The Anderson seam in the PSO Tract area is correlatable to and is also called the Dietz 1 seam. The Dietz 1 seam in the PSO Tract area is correlatable to and is also called the Dietz 2 seam. The Dietz 2 seam in the PSO Tract area is correlatable to and is also called the Dietz 3 seam. For the sake of consistency, the two mineable coal seams within the PSO Tract will be referred to as the Dietz 1 and Dietz 3 coal seams throughout the remainder of this EIS.

Thickness of the coal seams varies across the PSO Tract area. The Dietz 1 coal seam is present only in the northern half of the site because of erosion and burning, and its thickness increases from approximately five ft to an average of approximately 20 ft in Sections 22 and 23 of T.58N., R.84W. The Dietz 3 seam is present across the proposed mining area and ranges in thickness from approximately 10 to 50 ft, averaging about 41 ft. Overburden above the Dietz 1 seam ranges from approximately 25 to 275 ft in thickness. The overburden above the Dietz 3 where Dietz 1 is not present is

from 20 to 120 ft thick. The interburden thickness between the Dietz 1 and Dietz 3 seams ranges from 20 to 140 ft, with a thickening trend from east to west.

The stratigraphy in the PSO Tract area is similar to that found at the other surface coal mining sites in the general area (Figure 3-1). Overburden and interburden consists of "burn" or scoria, siltstone, shale and minor sandstone units. Burn is present at several locations in the PSO Tract area, particularly to the south where the Dietz seams crop out at the surface.

Two northeast-trending structural faults approximate the northwest and southeast boundaries of the proposed mining area (Figure 3-2). Though not accurately defined by drilling yet, the displacements across each of these two major faults are estimated to be 60 to 180 ft. Generally, the stratigraphic dip is to the northeast at approximately 4 percent between the faults. There are local areas where the shallow strata dip at higher angles, generally due to local folding or faulting.

The Lebo Shale and Tullock members of the Fort Union Formation, which underlie the Tongue River member (Figure 3-3), would not be disturbed if mining occurs. They consist primarily of sandstone, siltstone, mudstone, shale and coal. In general, the Tullock member contains more sand than the Lebo Shale member.

Mineral Resources

The PRB contains large reserves of fossil fuels including oil, natural gas or methane (from conventional reservoirs and from coal beds), and coal, all of which are currently being produced. In addition, uranium, bentonite, and scoria are mined in the PRB (BLM 1996f).

Coal. Some of the largest accumulations of subbituminous coal reserves in the world are contained within the PRB. Surface coal mining occurs where the coal is at its shallowest depth, i.e., nearest the outcrops along the eastern and western edges of this structural basin. Active surface coal mining in the PRB is centered in two general zones: the eastern side of the basin and the western side of the basin. The eastern zone is in Campbell and Converse Counties, starting about 20 miles north of Gillette, Wyoming and extending south for about 75 miles. The major producing seams in that area are the Fort Union's Anderson and Canyon seams (combined they form the Wyodak seam). The western zone is an area between Sheridan, Wyoming (the Sheridan Coal Field) and Colstrip, Montana. At the present time there are six active surface mines in the western zone, all of which are located in Montana. Numerous old, abandoned underground coal mines exist immediately north of Sheridan, as does the recently reclaimed Big Horn Coal Mine and an older unnamed strip mine, known locally as the Hidden Water pits (Figure 3-1). Near the Montana State line the major

producing seams are the Fort Union's Monarch and Dietz seams.

A surface coal mine north of Sheridan was permitted with the WDEQ in 1976 as the PSO No. 1 Mine, which is now called the Ash Creek Mine (WDEQ Permit No. 407). This mine is located in the northeast quarter of Section 22, T.58N., R.84W., adjacent to the federal coal being considered for exchange. An initial box cut, overlying privately owned coal, was opened in the late 1970s. The mine plan was contingent upon approval and construction of a proposed railroad spur for an adjacent proposed mine in Montana. No method of coal transportation was built and all operations ceased in 1980. Operations remained suspended through 1995 when reclamation activities began. Reclamation was completed and a full area bond release request by the Ash Creek Mining Company was granted by WDEQ/LQD in 1996. Mine Permit 407 was transferred from Central and Southwest Services, parent company of the Ash Creek Mining Company, to P&M in 1997.

The Fort Union coal seams are subbituminous and are generally low-sulfur, low-ash coals. The quality of the recoverable coal reserves within the area of the federal coal being considered for exchange is represented by the analyses (done on an as-received basis) of recent exploration drilling samples collected by P&M. The Dietz 1 seam has a weighted average heating value of approximately 9,279 Btu/lb and contains 5.8 percent ash and 0.44 percent sulfur. The Dietz 3 seam has a weighted average heating value of approximately 9,352 Btu/lb and contains 5.4 percent ash and 0.53 percent sulfur. The volatile matter, fixed carbon and moisture percentages were not available from the analyses of these recently obtained samples, although those values for the Dietz 1 and Dietz 3 seams, respectively, as determined for the PSO No. 1 Mine area were as follows: 31.68 percent and 32.98 percent for volatile matter, 35.82 percent and 36.43 percent for fixed carbon, and 26.05 percent and 26.05 percent for moisture (Ash Creek Mining Company 1984).

Oil and Gas. Oil and gas have been produced in the PRB for more than 100 years from reservoir beds that range in age from Pennsylvanian to Oligocene (DeBruin 1996). There are approximately 500 fields that produce oil and/or natural gas. The estimated mean amounts of undiscovered hydrocarbons in the basin are 1.94 billion barrels of recoverable oil and 1.60 trillion $ft^3$ of gas (USGS 1995). Depth to gas and oil-bearing strata is generally between 4,000 ft and 13,500 ft, but some wells are as shallow as 250 ft.

The western portion of the PSO Tract is located near geologic structures that contain producible quantities of oil. The Ash Creek and Ash Creek South Fields, both discovered in the early 1950s, are located in T.10S., R.38E., Section 3, Big Horn County Montana, and in T.58N., R.84W., Sections 29, 30, 31, and 32, Sheridan County, Wyoming, respectively.

Production is from the Upper Cretaceous Ash Creek sandstone, which lies approximately 4,600 ft below the surface in this area (Morgando 1958). See Section 3.4.11 for further discussion of wells that are currently producing and associated facilities.

Coal Bed Methane. The generation of methane gas from coal beds occurs as a natural process. Methane produced by coal may be trapped in the coal by overburden pressure, by the pressure of water in the coal, or by impermeable layers immediately above the coal. Deeper coal beds have higher pressures and generally trap more gas. Under favorable geologic conditions, methane can be trapped at shallow depths in and above coal beds, and this seems to be the case in the PRB. Without the existence of conditions which act to trap the gas in shallow coals or in adjacent sandstones, the gas escapes to the atmosphere. It is likely that much of the methane generated by the coal beds in the PRB has gradually escaped into the atmosphere because of the relatively shallow coal burial depths. A recent study estimates that there are approximately 38.2 trillion cubic ft of CBM gas in place in PRB coal beds and that an estimated 25.6 trillion cubic ft of that gas is recoverable (Finley and Goolsby 2000). The authors of this study indicated that these numbers reflect only coal beds that are thicker than 20 ft and deeper than 200 ft because it is generally accepted by industry that coal beds 20 ft or more are necessary for economic production of CBM and that coal beds less than 200 ft deep have already been de-pressured and much of the gas has escaped to the atmosphere.

Historically, methane has been reported flowing from shallow water wells and coal exploration holes in parts of the PRB. According to DeBruin and Jones (1989), most of the documented historical occurrences have been in the northern PRB. Olive (1957) references a water well in T.54N., R.74W. which began producing gas for domestic use in 1916.

CBM has been commercially produced in the Powder River Basin since 1989 when production began at Rawhide Butte Field, west of the Eagle Butte Mine. CBM exploration and development is currently ongoing throughout the PRB in Wyoming, and it is estimated that there are now more than 5,000 productive wells in place.

Since the early 1990s, the BLM has completed numerous EAs and two EISs analyzing CBM projects. The Wyodak CBM Project EIS was completed in 1999. It studied 3,600 $mi^2$ of mixed federal, state, and private lands. The EIS analyzed the impacts of drilling and producing up to 5,000 new federal, state, and private CBM wells in addition to the 890 wells that had been evaluated in previous NEPA documents. BLM subsequently completed an EA to analyze the impacts of drilling as many as 2,500 additional federal drainage protection wells within the Wyodak EIS project area (BLM 2000).

These wells are being drilled and produced to prevent the loss of federal CBM resources and corresponding royalties from undrilled federal oil and gas leases that are adjacent to and potentially being drained by wells drilled on private or state lands. BLM is currently preparing a new EIS to analyze the cumulative impacts of reasonably foreseeable CBM and conventional oil and gas development within the Wyoming portion of the PRB. The PRB Oil and Gas Project Draft EIS was mailed to the public in January 2002.

Approved spacing for CBM wells in the PRB is one well per coal seam per 80 acres, or eight well cluster locations per section. Since there are three potential coal seams (i.e., Dietz 3, Monarch, and Carney) that would be to produce CBM in the Ash Creek area, a total of 78 CBM wells could be drilled within the boundary of the federal coal being considered for exchange. As of June 2001 CBM was not being produced on the PSO Tract, although five wells had been drilled on privately-owned oil and gas leases in the PSO Tract. Four additional CBM wells have been permitted on the tract.

The ownership of oil and gas resources, including CBM, in the PSO Tract is discussed in Section 3.4.11 of this EIS.

Bentonite. Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, and because of this characteristic it is used in a number of processes and products, including cat litter and drilling mud. No mineable bentonite reserves have been identified on the PSO Tract.

Uranium. Uranium exploration and mining were very active in the 1950s, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply reduced uranium mining activities in the early 1980s. There are currently two in-situ leach operations in central Converse County in the southern PRB. Production at another ended in 2000. No known uranium reserves exist on the PSO Tract.

Scoria. Scoria or clinker has been and continues to be a major source of gravel for road construction in the area. Scoria is present in the PSO Tract area.

No mining claims, mineral material sales contracts, free use permits, or solid mineral leases exist within the PSO Tract.

### 3.4.4 Soils

The soils on the PSO Tract are typical of the soils that occur on the adjacent lands. The area covered in this study was covered by a soil survey completed and published by the NRCS.

Based on the NRCS soils studies, there is enough suitable topsoil for salvaging within the PSO Tract area to redistribute suitable soils to a depth of about two to three ft over all disturbed areas.

All soil surveys were completed to an order 2-3 resolution by the NRCS. The inventories included field sampling and observations at the requisite number of individual sites, and laboratory analysis of representative collected samples.

The following is a list of the soil series that comprise the various map units delineated on the affected area associated with the Proposed Action.

<u>Soils developing predominantly in alluvial or colluvial fan deposits</u>

- Bidman - Ulm, dry, complex, 0 to 6 percent slopes
- Cambria - Forkwood complex, 0 to 15 percent slopes
- Cushman - Forkwood association, 3 to 15 percent slopes
- Harlan loams, dry, 0 to 15 percent slopes
- Haverdad - Worthenton complex, 0 to 3 percent slopes
- Kishona - Cambria complex, 3 to 6 percent slopes
- Parmleed - Bidman association, 3 to 15 percent slopes
- Zigweid - Cambria loams, 0 to 15 percent slopes
- Zigweid - Kishona - Cambria complex, 6 to 15 percent slopes

<u>Soils developing predominantly in residuum on uplands</u>

- Baux - Bauxson association, dry, 0 to 65 percent slopes
- Cushman - Worf association, 3 to 25 percent slopes
- Parmleed - Worfka association, 0 to 15 percent slopes
- Shingle, moist - Baux - Rock outcrop complex, 30 to 60 percent slopes
- Shingle - Haverdad association, 0 to 80 percent slopes
- Shingle - Rock outcrop complex, 30 to 50 percent slopes
- Shingle - Samday clay loams, 6 to 60 percent slopes
- Shingle - Theedle - Kishona association, 6 to 25 percent slopes
- Shingle - Wibaux complex, 0 to 60 percent slopes
- Shingle - Wibaux complex, cool, 15 to 80 percent slopes
- Shingle - Worf complex, 6 to 15 percent slopes
- Spearman - Wibaux association, 6 to 25 percent slopes
- Theedle - Kishona association, 6 to 15 percent slopes

Soils developing predominantly in eolian sand deposits

- Hiland - Decolney complex, 3 to 15 percent slopes
- Taluce - Tullock - Vonalee association, 6 to 15 percent slopes

Table 3-1 provides the extent of five depth classes of suitable topsoil within the PSO Tract.

An average of about two ft of topsoil would be redistributed on all disturbed acres. Soils sites with high alkalinity, salinity or clay content are unsuitable for use in reclamation.

The soil depths and types on the PSO Tract are similar to soils currently being salvaged and utilized for reclamation at the other surface mines in the Sheridan area. The tract is expected to have an adequate quantity and quality of soil for reclamation. The site-specific soil surveys have located hydric soils and/or inclusions of hydric soils. The presence of hydrophytic vegetation and wetland hydrology would be determined during jurisdictional wetland determinations included in the mine permit application package (see Section 3.4.8).

### 3.4.5 Air Quality

#### 3.4.5.1 Air Quality Regulations

Air quality and pollutant emissions to the air are regulated under both federal laws and regulations (CAA) and Wyoming state laws and regulations implemented by the WDEQ. A fundamental requirement of both federal and state regulations is that ambient concentrations for specific criteria pollutants not exceed allowable levels, referred to as the AAQS. These standards have been established by the U.S. EPA and the WDEQ at levels deemed necessary to preclude adverse impacts on human

Table 3-1. Acres of Topsoil Available for Reclamation Within the Boundary of the Federal Coal Being Considered for Exchange Under the Proposed Action.

| Thickness of Suitable Topsoil (inches) | Acres | Percent |
|---|---|---|
| 0 | 0.0 | 0.0 |
| 0 - 12 | 83.1 | 4.1 |
| 12 - 30 | 1585.9 | 77.6 |
| 30 - 48 | 168.1 | 8.2 |
| 48 - 60 | 207.9 | 10.1 |
| Total | 2045.0 | 100.0 |

health and welfare. The applicable federal and Wyoming AAQS are shown in Table 3-2.

States designate areas within their borders as being in "attainment" or "non-attainment" with the AAQS. Since the PSO Tract is near the border of Wyoming and Montana, the attainment status of nearby areas in both states is considered. The PSO Tract is in an area is designated an attainment area for all pollutants. However, the town of Sheridan, Wyoming, located about 12 miles south of the project area, is a non-attainment area for $PM_{10}$. The town of Lame Deer, Montana, located about 50 miles northeast, is also a non-attainment area for $PM_{10}$. The towns of Laurel and Billings, Montana, non-attainment areas for $SO_2$, are located about 90 miles northwest of the project area.

Under requirements of the CAA, EPA has established PSD rules, the purpose of which is to prevent further deterioration of air quality in areas that are in attainment with the Absaroka Wilderness Area, located about 130 miles to the west of the site. The next closest Class I area is Wind Cave National park in South national AAQS. The increment allowable under PSD depends on the area's designation as Class I, II, or III. Increases in ambient concentrations of $NO_2$, $SO_2$ and $PM_{10}$ are limited to modest increments in Class II areas (most of the country), and to very small increments in Class I areas (national parks and other designated pristine areas). The closest Class I area to the PSO Tract is the North

Table 3-2. Federal and Wyoming Ambient Air Quality Standards.

| Emissions | Averaging Period | Wyoming Standard ($\mu g/m^3$) | Federal Standards Primary ($\mu g/m^3$) | Federal Standards Secondary ($\mu g/m^3$) |
|---|---|---|---|---|
| $PM_{10}$ | 24-hour[1] | 150 | 150 | Same |
| | annual[2] | 50 | 50 | Same |
| Sulfur Dioxide ($SO_2$) | 3-hour[1] | 1,300 | ---- | 1,300 |
| | 24-hour[1] | 365 | 365 | ---- |
| | annual[2] | 80 | 80 | ---- |
| Nitrogen Oxide ($NO_x$) | annual[2] | 100 | 100 | Same |
| Carbon Monoxide (CO) | 1-hour[1] | 40,000 | 40,000 | ---- |
| | 8-hour[1] | 10,000 | 10,000 | ---- |
| Ozone ($O_3$) | 1-hour[1] | 235 | 235 | Same |
| Lead (Pb) | Calendar Quarter | 1.5 | 1.5 | Same |

[1] Standards not to be exceeded more than once per year.
[2] Annual arithmetic mean not to be exceeded.
Source: Wyoming DEQ and US EPA air quality regulations.

Dakota, located about 195 miles east southeast of the site. The closest sensitive Class II areas to the PSO Tract include the Northern Cheyenne Indian Reservation, Cloud Peak Wilderness Area and Devil's Tower National Monument, which are approximately 25, 36 and 93 miles distant, respectively. Wyoming's PSD standards for particles are identical to federal standards, except that Wyoming has not adopted Class III standards (Table 3-3).

For a new major source, PSD regulations require specific permitting reviews to demonstrate that increments will not be exceeded and to ensure best available emission controls would be applied. A new mine is classified as a major source if potential emissions of any regulated pollutant equal or exceed 250 tpy. Fugitive emissions are not included in the definition of potential emissions except for certain specified source types [40 CFR 52.21, (b)(1)(iii)]. For the proposed Ash Creek Mine, the only fugitive emissions that would be counted toward the potential-to-emit for PSD applicability purposes are those directly associated with the coal preparation plant. Mining related fugitive emissions are exempt from the applicability determination.

The major type of emission from surface coal mining activities is fugitive dust. Blasting and moving overburden, crushing, loading, and hauling coal, and the large areas of disturbed land all produce dust. Wyoming's ambient air standards for $PM_{10}$ are shown in Table 3-2. $PM_{10}$ is respirable particulate matter (less than 10 microns) which can penetrate into the lungs and cause health problems. Wyoming recently dropped their standards for TSP in favor of $PM_{10}$ to match federal standards.

Blasting is also responsible for another type of emission from surface coal mining. Overburden blasting sometimes produces low-lying gaseous orange clouds which contain $NO_x$. Increasing public concern over this issue prompted a WMA-sponsored symposium, which was held in Gillette, Wyoming on January 12 and 13, 2000. The symposium brought together experts from the industry and regulatory agencies to discuss possible causes and solutions to excessive $NO_x$ emissions from

Table 3-3. Maximum Allowable Increases for Prevention of Significant Deterioration of Air Quality: Particles.

| Emission | Averaging Time | Maximum Allowable Increments of Deterioration ($\mu g/m^3$) Class I | Class II | Class III[2] |
|---|---|---|---|---|
| $PM_{10}$ | Annual Mean | 4 | 17 | -- |
| | 24-hour[1] | 8 | 30 | -- |

[1] Maximum allowable increment may be exceeded once per year at any receptor site.
[2] Wyoming has not adopted Class III standards.

blasting. Since that time, mine operators in the eastern PRB and blasting agent manufacturers have been working together to reduce $NO_x$ emissions through experimentation with different blasting agent mixtures and additives used with regard to the relative competency of the overburden and its moisture content. The use of sophisticated electronic detonation systems is another method currently being experimented with in an effort to reduce $NO_x$ emissions (Doug Emme, August 2001).

Vehicle traffic, both inside and outside the areas of surface coal mining, is responsible for tailpipe emissions and for the emission of fugitive dust from paved and unpaved surfaces. Vehicle emissions consist primarily of $NO_x$ and CO, but also may include $SO_2$ and, by secondary processes, ozone ($O_3$). The national and state standards for emissions of these substances are also shown in Table 3-2.

The compressor stations and generators associated with oil and gas production and transport and with fossil fuel-fired power plants produce emissions of $NO_x$, $SO_2$, CO, TSP, $PM_{10}$, volatile organic compounds, and smaller amounts of other pollutants.

The main pollutant of concern associated with the locomotives used to haul the coal and other commodities is $NO_x$. The main pollutants produced by farming and ranching activities are dust and $NO_x$.

In order to obtain a state air quality construction and operating permit, each mine may be required to demonstrate, through dispersion modeling, that its activities will not increase $PM_{10}$ levels above the annual standard established by the WAQSR (WDEQ/AQD 1995). The modeling demonstration must include the estimated air pollutant emissions from other existing pollution-generating activities, including adjacent mines, so that control of overall air quality is part of the permitting process.

Although fugitive emissions from mining activities during the most active mining year at the Ash Creek Mine are estimated to be 259 tpy, potential emissions that count towards the PSD applicability threshold would be much less than 250 tpy. Thus, the project would not be classified as a major source and would not be subject to PSD review. Because final engineering for the coal preparation plant is not complete, it is not possible to determine the exact level of emissions that would count towards the PSD threshold at this time.

NSPS Subpart Y, “Standards of Performance for Coal Preparation Plants” (40 CFR 60.250), applies to coal preparation plants that process more than 200 tpd of coal and which are constructed or modified after October 24, 1974. The standard applies to affected facilities at the plant, including (but not limited to) coal crushers, conveyors, storage systems, transfer and loading systems. The standard specifies opacity limits for affected units.

The proposed Ash Creek Mine satisfies the applicability requirements for this NSPS. Thus, affected equipment constructed at the coal preparation plant would be required to meet the requirements of this NSPS.

NSPS Subpart Kb, "Standards of Performance for Volatile Organic Liquid Storage Vessels" (40 CFR 60.1106), applies to certain storage vessels constructed or modified after July 23, 1984. This NSPS could apply to the facility depending upon final engineering. However, final engineering is not complete and details necessary to determine applicability of this NSPS standard are not yet available.

3.4.5.2 Affected Environment

The PSO Tract area is located in the Tongue River airshed, which comprises approximately 4,500 $mi^2$ in a rectangular area extending along the Tongue River from the Big Horn National Forest to the confluence with the Yellowstone River about 145 miles to the north northeast. Information on the climate and meteorology of the area, as presented in this section, is based on available data from the town of Sheridan as well as nearby stations.

Wyoming can be characterized as having a combination of both highland and mid-latitude semiarid climates. The dominant factors which affect the climate of the area are elevation, local relief and the mountain barrier effect. This barrier effect can produce marked temperature and precipitation differences between windward and leeward slopes. Generally, temperatures decrease and precipitation increases with increasing elevation. The climatic description of the project area itself is high plains semi-arid, characterized by large diurnal and seasonal variations in temperature and seasonal variations in precipitation.

The general climate of the area is typical of a semi-arid high plains environment with relatively large seasonal and diurnal variations in temperature and seasonal variation in precipitation. Long-term average monthly maximum, minimum and mean temperatures for Sheridan are presented in Table 3-4. These data show the large seasonal variation in temperature with the warmest month being July, with a mean at 69.6°F, while the coldest month is January, with a monthly mean at 19.0°F. July is the month with the warmest average maximum (86.7°F) while January is the month with the coolest average minimum (5.9°F). The annual mean temperature for the area is 43.9°F.

Precipitation data descriptive of the general region was obtained from a station east of Clearmont, Wyoming and presented in Table 3-5. The average annual precipitation received is 12.0 inches with the majority falling between April and September.

The month with the highest precipitation total is June 2.9 inches while the months with the lowest totals are December, January and

Table 3-4. Average Maximum, Minimum and Monthly Mean Temperatures for Sheridan, Wyoming.

| Month | Average Maximum (°F) | Average Minimum (°F) | Monthly Mean (°F) |
|---|---|---|---|
| January | 31.9 | 5.9 | 18.9 |
| February | 36.6 | 10.7 | 23.7 |
| March | 44.5 | 19.5 | 32.0 |
| April | 57.0 | 30.0 | 43.5 |
| May | 67.4 | 39.7 | 53.6 |
| June | 76.5 | 47.9 | 62.2 |
| July | 87.3 | 53.5 | 70.4 |
| August | 86.6 | 51.1 | 68.9 |
| September | 74.6 | 40.8 | 57.7 |
| October | 61.9 | 30.6 | 46.3 |
| November | 44.9 | 18.6 | 31.8 |
| December | 35.5 | 9.7 | 22.6 |
| Year | 58.7 | 29.8 | 44.3 |

[1] Sheridan Field Station; located 44.43°N and 106.83°W at 3,750 ft above sea level. Data period from 1920-2000; WRCC 2001.

Table 3-5. Climatic Monthly Precipitation For Arvada 3 N Located in Sheridan County, Wyoming.

| Month | Precipitation (inches) |
|---|---|
| January | 0.4 |
| February | 0.4 |
| March | 0.6 |
| April | 1.1 |
| May | 2.0 |
| June | 2.9 |
| July | 1.0 |
| August | 0.9 |
| September | 1.1 |
| October | 0.7 |
| November | 0.5 |
| December | 0.4 |
| Annual | 12.0 |

[1] Climatic precipitation data from NCDC cooperative station, 1936 through 1977. Arvada 3N in Sheridan County, located at 44.7°N and 106°W, at 3,681 ft above mean sea level; NCDC 2001.

February at 0.4 inch each. As is typical with a semi-arid area, year-to-year and month-to-month temperature and precipitation values can and will vary widely from the climatic averages.

Winds are greatly affected by local topographic features. Wind data have not been collected from the specific project area, but such data are available for a 5-year period from Sheridan. These data (1984 and 1987 through 1990) were processed into a joint frequency distribution of wind direction by wind speed and the results are presented as a wind rose diagram in Figure 3-4. The predominant wind directions for Sheridan are from the northwest and west-northwest at 12.7 percent and 11.5 percent of the time, respectively. The annual average wind speed for the period was 8.7 mph with the strongest winds coming out of the west-northwest (12.3 mph) and northwest (12.1 mph).

Wind data are also available for the last five years (1996 through 2000) from the Decker Coal Mine. These data were also processed into a frequency distribution of wind direction and are depicted as a wind rose diagram in Figure 3-4. The prevailing wind directions recorded at the Decker Mine are from the northwest and south, both at 12.5 percent of the time. Wind directions at the Decker meteorological station are strongly influenced by the local terrain and close proximity to the Tongue River Reservoir (Figure 3-4). The PSO Tract area is characterized by the Ash Creek and Youngs Creek drainages which both flow generally from the west-northwest toward the Tongue River to the east. The area has some complex terrain, especially in the western half of the property. As such, it is anticipated that the wind flow patterns will follow relatively closely the patterns observed at Decker, but with a greater frequency of return flows from the southeast sectors, up the drainage valleys, as a result of afternoon heating.

According to current regulatory standards by which air quality is defined, surface mining development in the Tongue River Basin has not resulted in impacts to air quality that have exceeded federal or state standards. The maximum 24-hour $PM_{10}$ concentration observed in the last six years (from nearby mine data) was 118 $\mu g/m^3$ recorded in 1995. Annual $PM_{10}$ concentrations average about 11 $\mu g/m^3$. These values are well below the AAQS of 150 and 50 $\mu g/m^3$ for the 24-hour and annual averaging times, respectively.

It is important to note that the non-attainment areas discussed in the air quality regulations section are not due to surface mining. Rather, they are the result of pollution generated in the immediate vicinity of those population centers.

The air quality of the PRB area is generally good. WDEQ/AQD assumes a background $PM_{10}$ concentration of 15 $\mu g/m^3$ for regulatory purposes (Judy Shamley, April 2000). Figure 3-5 is a depiction of visibility impairment measured in

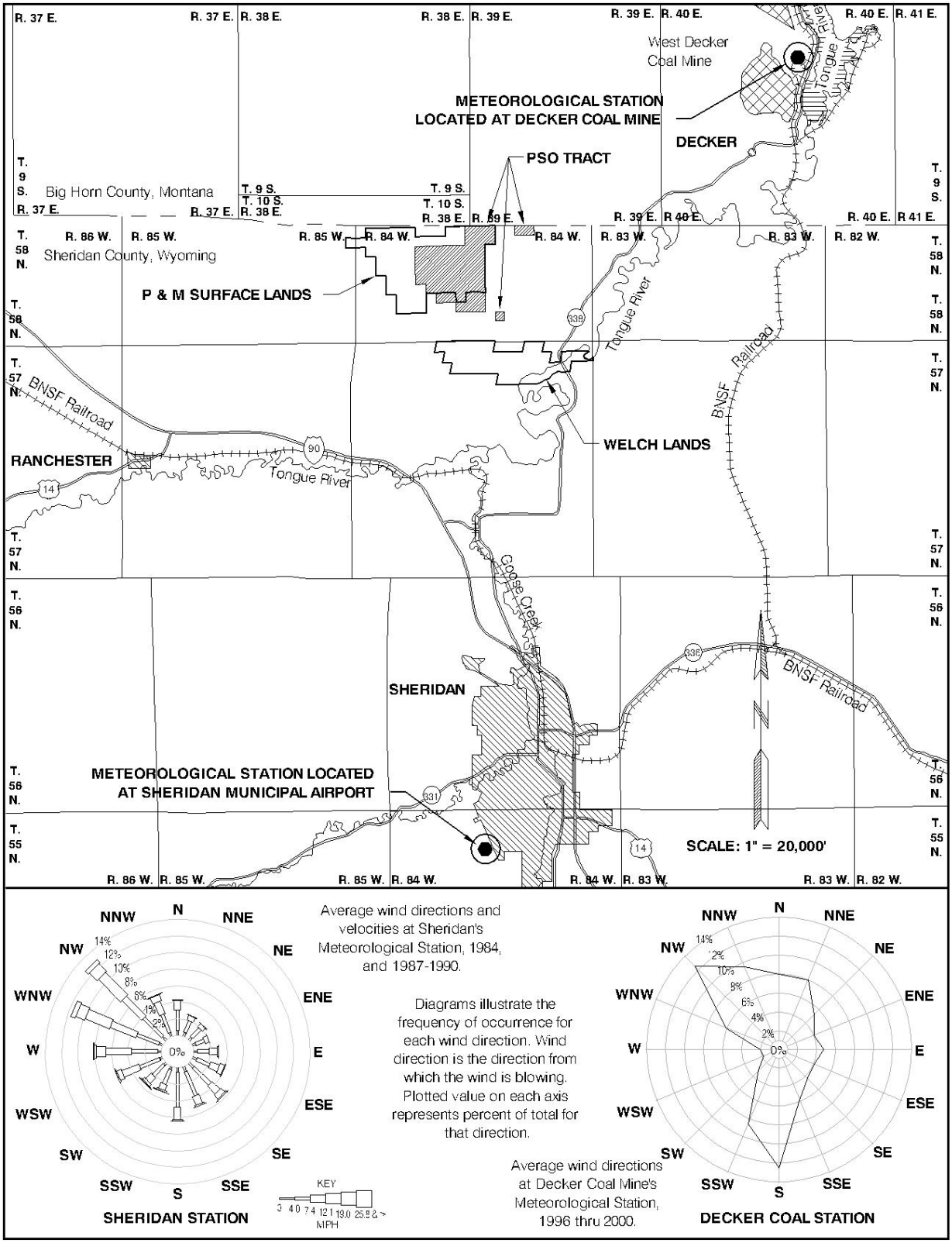



Figure 3-4. Wind Roses and Meteorological Stations at the Decker Coal Mine and Sheridan Municipal Airport near the PSO Tract.

deciviews (dv). A dv is a general measure of view impairment caused by pollution. A dv of 13 translates to a view of approximately 60 miles, which in the PRB is common viewing distance. As can be seen from Figure 3-5, the only areas of the U.S. with less view impairment than the PRB are the Colorado Plateau (dv = 11) and the Great Divide Basin (dv = 10).

### 3.4.6 Water Resources

#### 3.4.6.1 Groundwater

Within the PSO Tract there are two water-bearing geologic units that could be disturbed by mining. These units are the alluvium of West Branch, Little Youngs Creek and Youngs Creek, and the Dietz 1 and Dietz 3 coal seams. The sub-Dietz coal Fort Union Formation would not be disturbed by mining activities. The stratigraphic units beneath the PSO Tract and the hydrologic properties are displayed in Figure 3-3.

The PSO No. 1 Mine completed 17 monitoring wells near the PSO Tract in 1980; two in the Dietz 1 seam, five in the Dietz 3 seam, and ten in the alluvium (Figure 3-6). As discussed previously, the Ash Creek Mine, as it is currently called, was initially permitted as the PSO No. 1 Mine in 1976. This was prior to most of the current regulations and guidelines governing surface coal mining in Wyoming. Most of the monitoring wells for the PSO No. 1 Mine were installed after pit development; therefore, groundwater level drawdowns had already occurred at many of the well locations when the first measurements were recorded.

The future of the PSO No. 1 Mine was contingent upon approval and construction of a proposed railroad spur for an adjacent mine in Montana that was being contemplated by Shell Oil Company. The pit remained open until late 1995 when reclamation of the PSO No. 1 Mine site began. By mid-1996 reclamation was complete and a single backfill monitoring well was then installed. Data from the PSO No. 1 Mine's 18 monitoring wells, as well as data collected by MBMG to identify the hydrogeology of the adjacent proposed surface coal mine area in Montana (Hedges, et al. 1980), were used to prepare the following description of the baseline groundwater conditions in the PSO Tract area. Figure 3-6 shows the locations of the PSO No. 1 Mine pit and the MBMG monitoring wells as well as the 18 PSO No. 1 Mine monitoring wells.

Recent Alluvium. Within the boundary of the federal coal being considered for exchange, alluvium is present along West Branch. Little Youngs Creek is located just north of the tract proposed for exchange and could be affected if privately owned coal adjacent to the tract is mined (Figure 2-2). The alluvium along Little Youngs Creek ranges from roughly 50 to 100 ft wide and consists of 10 to 20 ft of fine-grained clays, silts and sands underlain by up to 35 ft of coarse sand and scoria gravel (Ash Creek Mining Company 1984). Hedges, et al. (1980) reported that slightly thicker deposits of

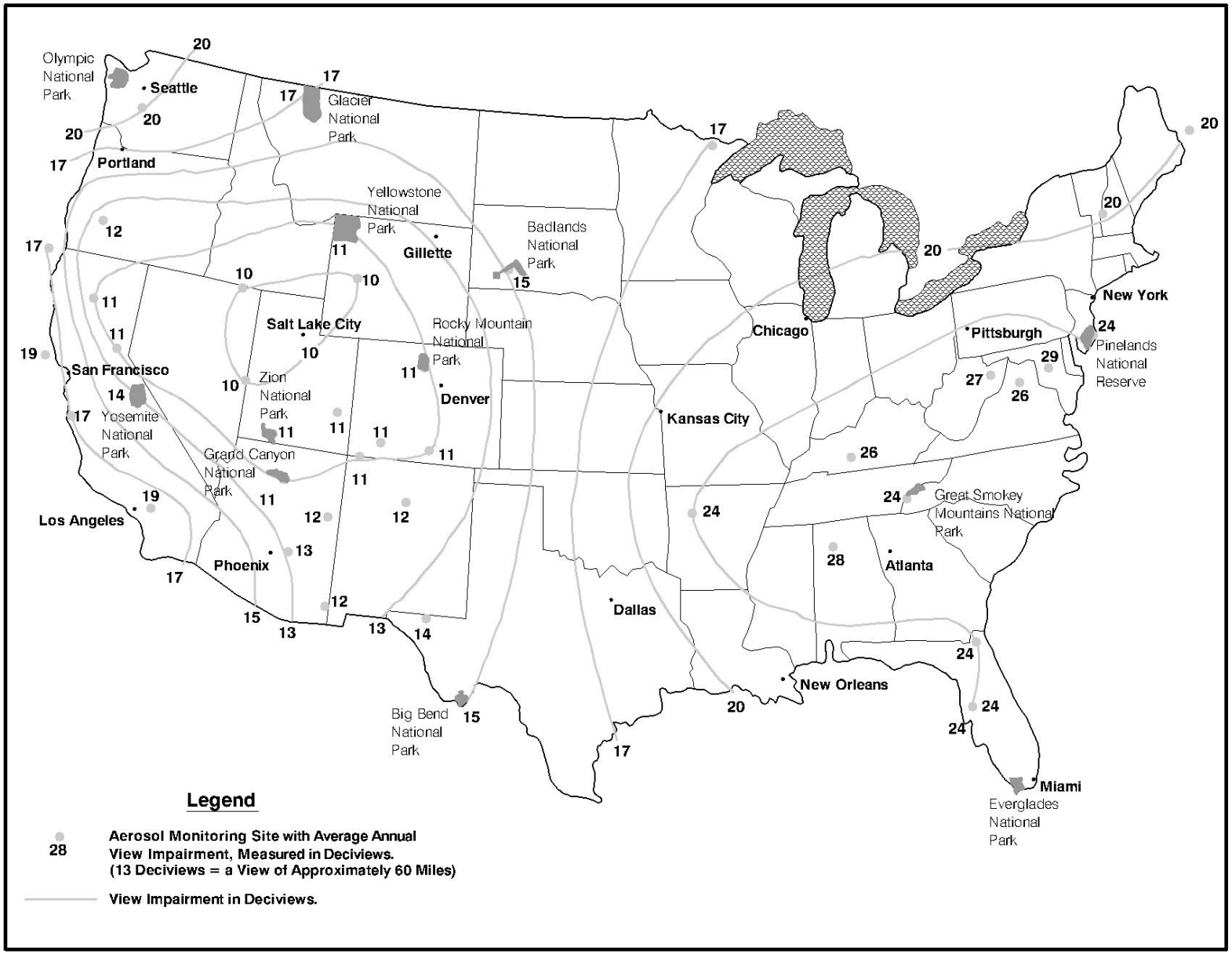



Figure 3-5. Average Annual View Impairment as a Function of Light Extinction. (From IMPROVE, 1995)

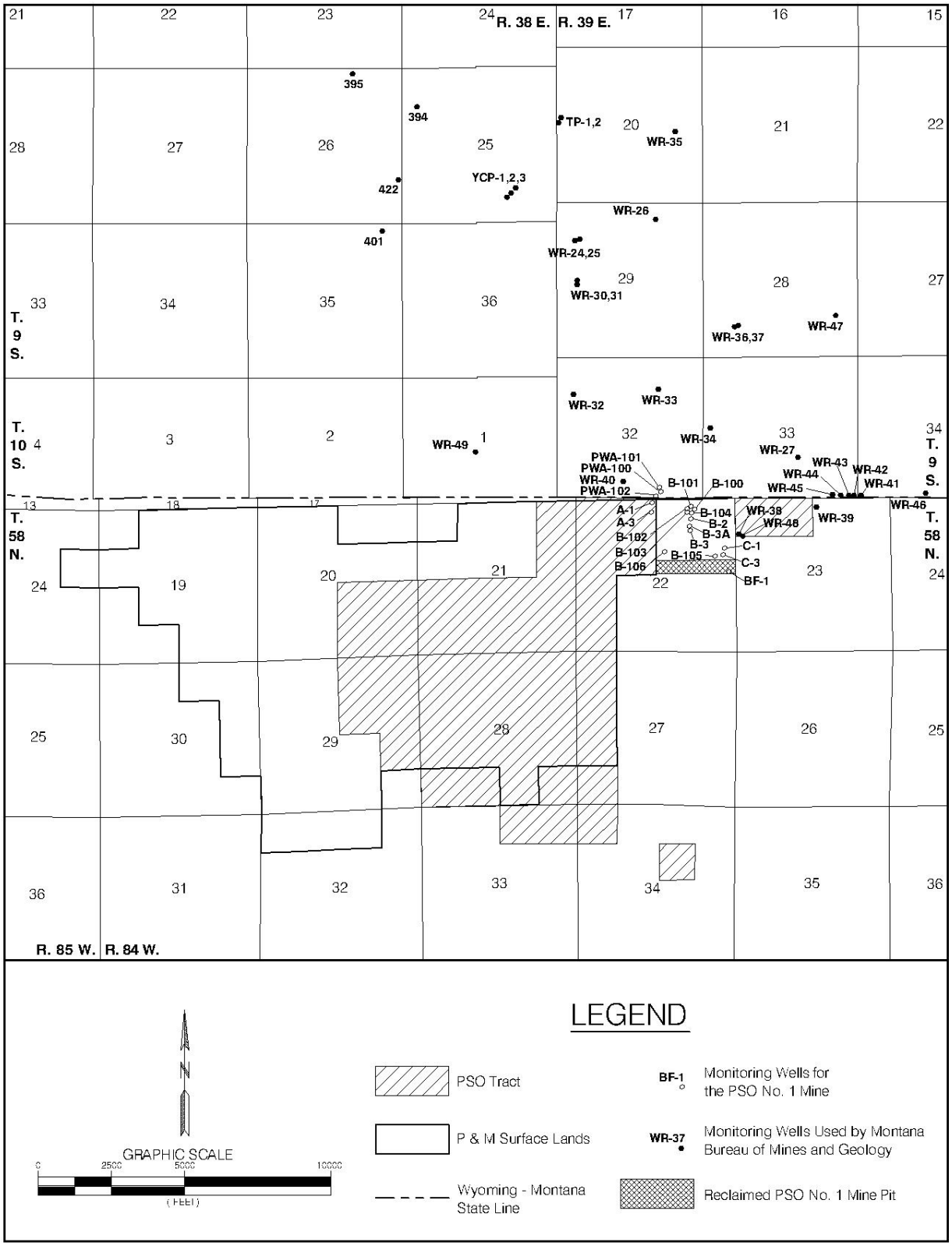



Figure 3-6. Monitoring Well Locations Within and Adjacent to the PSO Tract.

alluvium occupy the bottom of the Youngs Creek drainage where the maximum thickness of unconsolidated materials is approximately 65 ft. Alluvial deposits along West Branch are not extensive and were not intensively investigated for the baseline hydrology section of the PSO No. 1 Mine permit application.

The hydraulic properties of the alluvium are variable, although the coarse material in the basal Little Youngs Creek alluvium forms a moderate to high yield aquifer. The hydraulic conductivity of the Little Youngs Creek alluvium ranges from 86 to 134 ft/day, the average computed for the entire saturated thickness is about 120 ft/day (Ash Creek Mining Company 1984). Aquifer testing of both the Little Youngs Creek and Youngs Creek alluvium also indicated that the groundwater is confined in the coarse-grained basal materials beneath the overlying clay and silt deposits at some well locations, whereas at other locations the basal gravels may not behave as a confined aquifer.

Water levels in the Little Youngs Creek alluvium were affected by the construction of the initial pit of the PSO No. 1 Mine. The pit did not disturb the majority of the valley fill of Little Youngs Creek, although some alluvium was removed. As a result, the natural groundwater flow pattern was altered and gradients were toward the pit until backfilling occurred in 1996. Since reclamation, alluvial groundwater levels have apparently fully recovered and underflow through the alluvium has been reestablished.

Alluvium along the area's watercourses transmits large volumes of groundwater southeastward. It is recharged vertically from streamflow and precipitation, and laterally from subcrops of discharging bedrock aquifers. It provides temporary storage of water during periods of high streamflow and returns it to the streams during periods of low streamflow. Most flow in the alluvium occurs within the basal gravels that consist of locally derived burn/clinker materials.

Groundwater sampled from the Little Youngs Creek alluvial aquifer is generally a magnesium, calcium-bicarbonate type. The TDS concentrations are usually about 500 to 600 mg/l, and it is classified as permissible to good for irrigation and livestock uses.

Clinker. Another geologic unit consisting of sediments that overlaid a coal seam at one time in the past before the coal burned naturally is clinker, also called scoria or burn. These sediments were baked, fused and melted in place, then collapsed into the void left by the burned coal. Scoria deposits can be a very permeable aquifer and can extend laterally for miles in the PRB. Scoria deposits occur within the PSO Tract area. The hydrologic function of scoria in the general area is to provide infiltration of precipitation and recharge to laterally contiguous Dietz 1 and Dietz 3 coal seams.

Dietz 1 and Dietz 3 Coal Seams. Due to their lateral continuity, the Dietz 1 and Dietz 3 coal seams are considered regional aquifers within this area of the PRB, although both are somewhat low yielding. Within the PSO Tract area the Dietz 1 coal seam is present over a wide range of depths below the surface (approximately 25 to 275 ft), and due to erosion and burning it occurs as a 20-ft thick seam only in the northern half of Sections 22 and 23, T.58N., R.84W. The Dietz 2 and Dietz 3 seams have an interburden thickness ranging from approximately 20 to 40 ft. The Dietz 2 seam is present only in the southern part of the PSO Tract area and is less than 5 ft thick. Therefore, the Dietz 2 is not considered mineable, nor is it considered an aquifer in this area. The Dietz 3 seam is present across the entire general area and ranges from approximately 10 to 50 ft thick.

The value of the Fort Union coal seams as sources of groundwater is largely dependent upon their depths and occurrence with respect to recharge areas. In addition, the hydraulic conductivity of a coal seam is typically highly variable and is reflective of the amount of fracturing the coal has undergone, as unfractured coal is virtually impermeable. The yield of groundwater to wells and mine pits is smallest where the permeability of the coal is derived primarily from localized unloading fractures. These fractures, which are the most common, were created by the expansion of the coal as the weight of overlying sediments was slowly removed by erosion. The highest permeability is imparted to the coal by tectonic fractures. These are through-going fractures of areal importance created during deformation of the Powder River structural basin. The presence of these fractures can be recognized by their linear expression at the ground surface, controlling the orientation of stream drainages and topographic depressions. Due to their pronounced surface expression, these tectonic fractures are often referred to as “lineaments”. Coal permeability along lineaments can be increased by orders of magnitude over that in coal fractured by unloading only.

The hydraulic properties of the coal seams within and adjacent to the PSO Tract are expected to be very similar to those that were determined by aquifer pump testing some of the monitoring wells shown in Figure 3-6. The hydraulic conductivity of the Dietz 1 and Dietz 3 coal seams ranges from 0.13 to 3.6 ft/day. The average hydraulic conductivity for the coal bed aquifers is estimated to be 1.0 ft/day (Hedges, et al. 1980). The average storage coefficient value was determined to be roughly 0.0003, indicative of a confined aquifer and typical for Fort Union coal seams that are usually overlain and underlain by relatively impermeable siltstone and shale strata. These values agree well with those measured at other surface mining operations in this general area of the PRB.

Prior to mining, the direction of groundwater flow within a coal aquifer is generally from the recharge

areas near the outcrop and burn zones downgradient following the dip of the coal. Variations in the degree and extent of fracturing (thus transmissivity), outcrop geometry, and structural faulting also control flow patterns.

The Dietz 1 seam receives recharge via clinker along the coal's burned outcrop areas and in places where subcrops of the coal lie beneath the water table in alluvium along watercourses. Discharge from the system ultimately occurs along the Tongue River east-northeast of the PSO Tract area. The northeast-trending faults act to control the groundwater flow patterns, as stratigraphic displacements across the faults act as barriers to groundwater flow. The subcrop line, or leading edge of the Dietz 1 coal seam, is located in Sections 20, 21, and 22, T.58N., R.84W., and the structural gradient is downward to the northeast. The Dietz 1 coal therefore does not occur contiguously to the west or south and essentially no recharge west or south of the PSO Tract area can occur. The subcrop zone lies beneath the alluvium of the West Branch and Little Youngs Creek and the seam is saturated downdip to the northeast indicating the alluvial subcrop is a source of recharge. Discharge from the Dietz 1 coal aquifer occurs mostly at the seam's subcrops beneath the Tongue River valley to the east-northeast of the PSO Tract area.

The Dietz 3 seam is burned over broad areas of the Little Youngs Creek and Ash Creek drainages west and north of the PSO Tract area. The structurally and topographically high outcrops of scoria there are the primary recharge areas. Discharge from the Dietz 3 coal aquifer occurs mostly at the seam's subcrops beneath the Tongue River valley to the east-northeast of the PSO Tract area.

The baseline potentiometric surfaces of the Dietz 1 and Dietz 3 beds are very similar and are in fact identical where the two beds converge downdip of the PSO Tract area. Groundwater flow direction in both the Dietz 1 and Dietz 3 seams is to the northeast parallel to the structural gradient and bounded by the northeast-trending fault planes.

Site-specific water level data collected at monitoring wells shown in Figure 3-6 indicate that opening the PSO No. 1 Mine box cut pit in 1976 caused groundwater level drawdowns to occur locally in both the Dietz 1 and Dietz 3 coal seams due to pit dewatering, although the general flow direction remained toward the northeast, down the structural gradient. The pit penetrated through the Dietz 1 coal in 1976. This coal seam is dry near the pit, but monitoring wells located north of the pit which do have water in them recorded drawdowns. Currently, groundwater flow in the Dietz 1 seam is still toward the pit and this should continue until the backfill fully saturates and equilibrium is reestablished. Recovery has proceeded rapidly since reclamation occurred. The PSO No. 1 Mine pit partially removed the interburden

between the Dietz 1 and Dietz 3 seams. As a result, groundwater from the Dietz 3 seam migrated through the confining layer upward into the excavation, lowering the hydrostatic pressure. Reclamation has apparently stopped the upward leakage, as groundwater levels have been quickly increasing (P&M 2001), although recent nearby CBM activity may now influence the rate at which premining equilibrium will be reached.

The chemistry of groundwater in the coal seams is variable with respect to location from the recharge areas. In waters near recharge areas, magnesium, calcium, sodium, sulfate and bicarbonate are all present in significant concentrations. At a short distance downgradient (northeastward), magnesium and calcium concentrations are reduced and sodium becomes the principal cation. Similarly, the percentage of sulfate concentration is reduced leaving bicarbonate the predominant anion. Further downgradient sulfate is nearly absent, leaving sodium and bicarbonate overwhelmingly the predominant ions. TDS concentrations range from 1,000 to 3,000 mg/l. The SAR is typically very high and the water is poor to unsuitable for most uses except livestock watering (Hedges et al. 1980, and Ash Creek Mining Company 1984).

Sub-Dietz Coal Fort Union Formation. No hydrologic units below the Dietz 3 coal seam would be directly disturbed by the proposed Ash Creek Mine. The thickness of interburden between the Dietz 3 seam and the next water-bearing unit, which is the Monarch (also called the Lower Monarch or Canyon) coal seam, is approximately 100 ft. Roughly another 100 ft of interburden separate the Monarch seam from the next aquifer - the Carney coal seam. Below the Carney seam the Tongue River Member is interbedded with the Lebo Shale Member of the Fort Union Formation. The Lebo Member, also referred to as the "Lebo Confining Layer" is typically more fine-grained than the other two members and generally retards the movement of water (Lewis and Hotchkiss 1981). Beneath the Lebo Member is the Tullock Member, consisting of discontinuous lenses of sandstone separated by interbedded shale and siltstone. The transmissivities of the Tullock Member sandstones are generally high and many of the surface mines in the PRB have water supply wells completed in this interval (Martin, et al. 1988). However, due to its excessive depth, the Tullock Member is not utilized as a source of water in this area of the PRB.

In the vicinity of the PSO Tract area the hydrologic units stratigraphically beneath the Dietz 3 coal seam that have been or are presently being dewatered are the Monarch and Carney coal seams. The Monarch seam was mined at the Big Horn Coal Mine and actively dewatered until final reclamation was completed in 2000. Currently, CBM development is occurring to the north, south, and east of the PSO Tract area and is reducing water levels in the Dietz 3,

Monarch and Carney coal seam aquifers.

Lance and Fox Hills Formations. Underlying the Fort Union Formation is the Lance Formation of Cretaceous age. At the base of the Lance Formation is the Fox Hills Sandstone. Neither the Lance or Fox Hills Formations are to be affected by the proposed Ash Creek Mine, nor are these formations being affected or utilized as a source of groundwater in the general Ash Creek area.

3.4.6.2 Surface Water

The area surrounding the PSO Tract consists of relatively flat, rounded uplands dissected by numerous deep, steeply sloping ravines. In general, the streams within this area are typical for the region, and their flow events are closely reflective of precipitation patterns. Flows would be expected to vary widely on a seasonal and annual basis. Flow events frequently result from snowmelt during the late winter and early spring. Although peak discharges from such events are generally small, the duration and therefore percentage of annual runoff volume can be considerable. Perhaps as much as 60 to 80 percent of the annual streamflow volume would be expected to result from spring snowmelt runoff. During the spring, general storms (both rain and snow) increase soil moisture, hence decreasing infiltration capacity, and subsequent rainstorms can result in both large runoff volumes and high peak discharges. The surface water quality varies with streamflow rate; the higher the flow rate, the lower the TDS concentration but the higher the suspended solids concentration. Surface water features within and adjacent to the PSO Tract are displayed in Figure 3-7.

Surface water drainages within and adjacent to the PSO Tract area include Youngs Creek, Little Youngs Creek, West Branch and Ash Creek. The streams of primary interest are the main stems of Little Youngs Creek and its tributary, West Branch. Little Youngs Creek is a tributary to Youngs Creek, which is a tributary to Tongue River. The PSO Tract area lies within the drainages of Youngs Creek and Ash Creek, although the main stems of these two streams do not fall within the boundary of the federal coal being considered for exchange. West Branch lies within the PSO Tract. The relationship between the area of the federal coal being considered for exchange and the area of the proposed Ash Creek Mine, which includes privately-owned coal adjacent to the PSO Tract, is shown on Figure 2-2. Little Youngs Creek flows in an east-southeast direction towards its confluence with Youngs Creek, and West Branch flows eastward toward its confluence with Little Youngs Creek (Figure 3-7).

Little Youngs Creek originates in the Wolf Mountains in Montana. Only about 22 percent of its drainage area is situated within the State of Wyoming. The drainage area of Little Youngs Creek above the state line is approximately 13.8 $mi^2$. Little Youngs Creek streamflow varies with

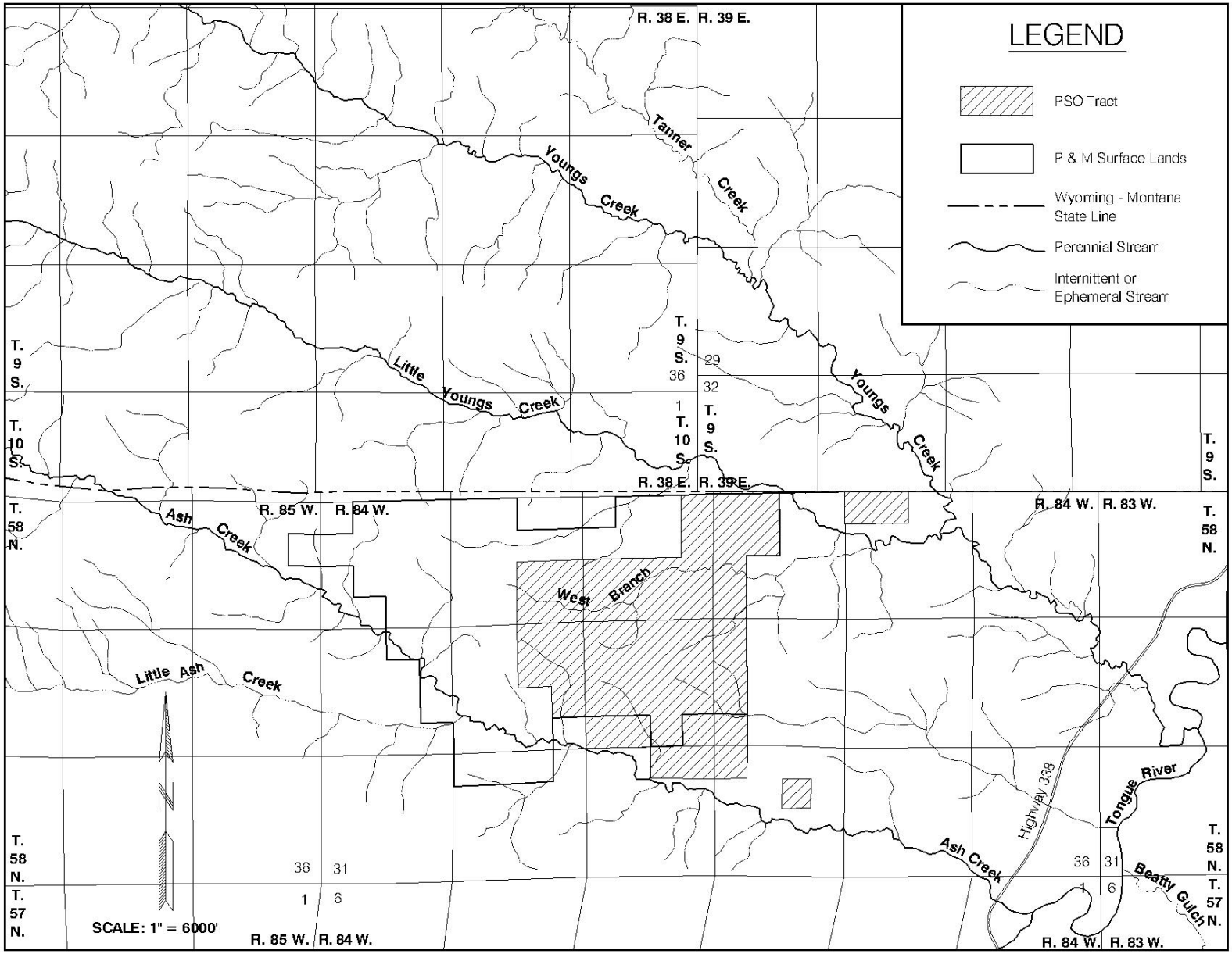



Figure 3-7. Surface Water Features Within and Adjacent to the PSO Tract.

the seasons and is further affected by stream diversions for stock reservoirs and irrigation withdrawals, as well as irrigation return flows. During the low-flow season, streamflow is maintained largely by groundwater seepage from the alluvial system (Hedges, et al. 1980). Based primarily upon long-term observations by local residents, Little Youngs Creek would be classified as a perennial stream, particularly throughout its lower reaches. These observations also indicate that the natural base flow is very small, probably only a fraction of one $ft^3$ per second during the low-flow season. During the driest years there may be periods of time when there is no streamflow. A streamflow monitoring station located about one-half mile upstream of the state line was maintained by Shell Oil Company for portions of the 1980 through 1982 water years, and records from that station indicate that the stream was dry for prolonged periods of time during the low-flow season (Ash Creek Mining Company 1984).

West Branch is classified as an ephemeral stream, meaning it flows only in direct response to snowmelt or precipitation runoff events. The West Branch alluvial system is not extensive enough to maintain streamflow by seepage of groundwater. The upper reach of this stream lies entirely within the PSO Tract area and its confluence with Little Youngs Creek is approximately 1 mile downstream (east) of the PSO Tract area.

The drainage area of Little Youngs Creek is approximately 17 $mi^2$ and the mean annual runoff is roughly 1,300 ac-ft. The entire drainage area of West Branch is situated in Wyoming and it is approximately two $mi^2$ in area. The mean annual runoff from the West Branch is roughly 150 ac-ft. Because no long-term streamflow data are available for Little Youngs Creek or West Branch, an indirect hydrologic correlation method was used to estimate the mean annual flows. Measured regional streamflows, precipitation records, and drainage basin characteristics were used to estimate the unit annual discharge for the Little Youngs Creek drainage basin.

In 1975, prior to any mining activities at the PSO No. 1 Mine, water samples were collected from Little Youngs Creek and West Branch to document baseline surface water quality in the general vicinity of the mine site (Ash Creek Mining Company 1984). Local surface waters were characterized as moderately alkaline, very hard and slightly turbid. Calcium and magnesium were the predominant cations while bicarbonate and sulfate were the major anions. The SAR was less than 1, indicating that the water is suitable for irrigation on all types of soils. Concentrations of nutrients were low indicating that upstream input of organic materials does not occur; however, relatively high fecal coliform bacteria values indicated that either domestic or animal wastes were entering the streams upstream from the mine. Surface water quality is usually unsuitable for domestic uses without treatment, but suitable for most agricultural uses, livestock and wildlife.

Flows and water quality are currently monitored on Little Youngs Creek by P&M both upstream and downstream of the reclaimed PSO No. 1/Ash Creek Mine site. These monitoring results are reported to the WDEQ/LQD annually (P&M 2001). In general, the TDS concentrations show no appreciable increase from upstream to downstream indicating that the reclaimed area has no apparent effect on surface water quality.

3.4.6.3 Water Rights

Records of the Wyoming SEO and the Montana DNRC were searched for groundwater rights within a three-mile radius of the federal coal lands being considered for exchange. This information would be required for a WDEQ mine permit application. SEO and DNRC data indicate there are 358 permitted water wells within three miles of the federal coal being considered for exchange, of which 345 are within Wyoming and 13 are within Montana. Of the 345 permitted wells in Wyoming, 83 are monitoring wells related to surface coal mining. There are 37 mine-related monitoring wells in Montana, although the DNRC does not require a Certificate of Water Right for scientific monitoring wells, as there is no beneficial use of water. Of the 275 other wells, 32 are permitted for stock watering, 16 are permitted for domestic use, 16 are permitted for stock watering and domestic use, 207 are permitted for both CBM development and stock watering, three are permitted for CBM development only, and one is permitted for miscellaneous use. In addition, a total of 76 CBM wells currently exist in Montana that are within a three mile radius of the federal coal being considered for exchange. Similar to monitoring wells, the State of Montana has ruled that a Certificate of Water Right is not required for a CBM well unless the discharge water is put to a beneficial use (i.e., stock watering). A listing of the 275 permitted wells that are not mining-related monitoring wells is presented in Appendix E.

Wyoming SEO and Montana DNRC records were searched for surface water rights within one-half mile upstream and three miles downstream of the federal coal lands being considered for exchange. Again, this information would be required for a WDEQ mine permit application. SEO and DNRC records indicate 98 permitted surface water rights within the search area, of which 89 are within Wyoming and nine are within Montana. Five of the 89 surface water rights in Wyoming are held by the PSO No. 1 Mine/Ash Creek Mining Company for industrial and miscellaneous uses. The 93 non-coal mine surface water rights are primarily for stock watering and irrigation uses, with a small number of domestic, industrial, miscellaneous, temporary and wildlife uses. A listing of the 93 non-coal mine surface water rights is included in Appendix E.

3.4.7 Alluvial Valley Floors

WDEQ regulations define AVFs as unconsolidated stream laid deposits

where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Prior to leasing and mining, AVFs must be identified because SMCRA restricts mining activities which affect AVFs that are determined to be significant to agriculture. Impacts to designated AVFs are generally not permitted if the AVF is determined to be significant to agriculture. If the AVF is determined not to be significant to agriculture, or if the permit to affect the AVF was issued prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored as part of the reclamation process. The determination of significance to agriculture is made by WDEQ/LQD, and it is based on specific calculations related to the production of crops or forage on the AVF and the size of the existing agricultural operations on the land of which the AVF is a part.

The portion of Little Youngs Creek that was within the PSO No. 1/Ash Creek Mine permit area was investigated for the presence of an AVF (Ash Creek Mining Company 1984). This area is not on the PSO Tract proposed for exchange, but it could be affected by mining operations on private coal if the exchange is completed. The investigation concluded that portions of Little Youngs Creek constitute an AVF within the northeastern portion of the PSO No. 1 Mine permit area, specifically where Little Youngs Creek crosses the NE¼ of Section 22, T.58N., R.84W. The two AVF components that led to this conclusion are the presence of unconsolidated stream-laid deposits and the existence of irrigation agricultural activities.

Three essential hydrologic functions were identified for restoration during the reclamation of the Ash Creek Mine: channel stability, alluvial underflow and flood irrigation. These three essential hydrologic functions were reestablished upon the mine's final reclamation. Because the PSO No. 1 Mine's pit did not disturb the majority of alluvial valley fill on Little Youngs Creek, groundwater underflow through the alluvium was not significantly changed. Irrigation ditches that were disturbed but had been neglected several years prior to disturbance were renovated, thus reestablishing the potential for flood irrigation. Reclaimed channels were constructed to safely convey the probable discharges at non-erosive velocities, thus reestablishing channel stability.

If P&M acquires the federal coal in the PSO Tract as proposed and applies for a permit to mine, the mine permit application submitted to WDEQ must include an investigation determining the presence of AVFs within the proposed permit area. As depicted by the schematic mine plan for P&M's proposed Ash Creek Mine (Figure 2-2), portions of West Branch, Little Youngs Creek, and Youngs Creek would be within the permit area. West Branch is within the PSO Tract. Little Youngs Creek and Youngs Creek are outside of the PSO Tract but would be disturbed if the privately-owned coal adjacent to the PSO Tract is mined as shown in

Figure 2-2. Ash Creek and its alluvial valley would be outside of the mined areas; therefore, it is unlikely that AVF investigations of the Ash Creek valley would be necessary. Specific declarations of the presence of AVFs and their significance to agriculture within the proposed Ash Creek Mine permit area would be made by WDEQ.

### 3.4.8 Wetlands

Wetlands are defined as areas inundated or saturated with surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (40 CFR 230.3 and 33 CFR 328.3). Wetlands generally include swamps, marshes, bogs and similar areas. Jurisdictional wetlands are those wetlands that are under regulatory authority of the EPA and the COE pursuant to Section 404 of the Clean Water Act. Such wetlands must exhibit all three diagnostic characteristics including hydrophytic vegetation, hydric soils and wetland hydrology under normal circumstances.

The presence of jurisdictional wetlands on a mine property does not preclude mining but does entail special permitting procedures to assure that after mining is completed there would be no net loss of wetlands. A wetland delineation must be done according to approved procedures (COE 1987) and submitted to the COE for verification as to the amounts and types of jurisdictional wetlands present. In Wyoming, once the delineation has been verified it is made a part of the mine permit document. The reclamation plan is then revised to incorporate at least an equal number and type of wetlands.

General jurisdictional wetland inventories were completed in 2001 on the federal coal lands considered for exchange. Formal inventories would be completed and submitted to the COE as a required part of the mine permit application. The wetland delineations are completed in accordance with the procedures and criteria contained in the COE 1987 Wetland Delineation Manual. A total of 15.32 acres of waters of the U.S. have been identified, of which 6.20 acres are estimated to be jurisdictional wetlands. The remaining 9.12 acres are classified as other waters of the U.S. The 6.20 acres of wetlands are associated primarily with man-made stock ponds while the 9.12 acres of other waters are associated with stockponds (6.3 acres) and ephemeral stream channels (2.82 acres).

### 3.4.9 Vegetation

A preliminary vegetation baseline study on the federal coal lands being considered for exchange was completed in 2001. The study area includes part or all of Sections 15, 20, 21, 22, 23, 27, 28, 29, 33 and 34, T.58N., R.84W. The vegetation communities in this area were delineated and mapped.

A total of three (3) vegetation types have been identified and mapped within the PSO Tract. Table 3-6 presents the acreage and percent of the area encompassed by each vegetation type within the PSO Tract. The vegetation types include Mixed Shrub Grass, Ponderosa Pine and Rough Breaks. These vegetation types are described as follows:

Mixed Shrub Grass. This vegetation type is the largest mapping unit identified within the PSO Tract, occupying approximately 1,592.1 acres, or 77.85 percent of the study area. This vegetation type typically occurs in upland positions throughout the study area. Major perennial species include big sagebrush (Artemisia tridentata), western wheatgrass (Agropyron smithii), bluebunch wheatgrass (Agropyron spicatum), needle-and-thread (Stipa comata), broom snakeweed (Gutierrezia sarothrae) and fringed sagewort (Artemisia frigida). Japanese chess (Bromus japonicus) is an annual species that is common on this vegetation type.

Ponderosa Pine. This vegetation type is the second largest mapping unit comprising approximately 330.8 acres, or 16.18 percent of the area. This vegetation type occurs throughout the study area on north facing rocky slopes, outcrops and smaller foothills. Along with ponderosa pine (Pinus ponderosa) several other plant species dominate this vegetation type. These species include skunkbush sumac (Rhus trilobata) and Rocky Mountain juniper (Juniperus scopulorum). The understory vegetation is dominated by bluebunch wheatgrass, broom snakeweed, fringed sagewort, green needlegrass (Stipa viridula) and hairy goldenaster (Heterotheca villosa).

Rough Breaks. This vegetation type occurs throughout the study area and makes up approximately 122.1 acres, or 5.97 percent of the study area. This vegetation type occurs on steep sideslopes and rocky outcrops. Common species for this vegetation type include big sagebrush, rubber rabbitbrush (Chrysothamnus nauseosus) broom snakeweed, winterfat (Ceratoides lanata) and fringed sagewort. Perennial grasses include bluebunch wheatgrass,western wheatgrass and needle-and-thread.

Table 3-6. Vegetation Types Identified and Mapped Within the PSO Tract.

| Vegetation Type | Acres | Percent of Area |
|---|---|---|
| Mixed Shrub Grass | 1592.1 | 77.85 |
| Ponderosa Pine | 330.8 | 16.18 |
| Rough Breaks | 122.1 | 5.97 |
| Total | 2045.0 | 100.00 |

Threatened, Endangered, and Candidate Plant Species

See Appendix C for a discussion of the threatened, endangered, and candidate plant species potentially present on the PSO Tract.

3.4.10 Wildlife

3.4.10.1 Wildlife Resources

Background information on wildlife in the vicinity of the PSO Tract area was drawn from several sources including: Ash Creek Mine Annual Reports, WGFD and USFWS records and personnel contacts with WGFD and USFWS biologists.

Site-specific data for the proposed exchange area was obtained from sources including WDEQ/LQD permit applications and annual reports for nearby mines. Baseline and monitoring surveys cover large perimeters around each mine's permit area. Consequently, a majority of the PSO Tract area has been surveyed during annual wildlife monitoring for the Ash Creek Mine. The entire PSO Tract area has undergone a wildlife survey, which was completed in July of 2000 through July of 2001.

The PSO Tract area and adjacent lands consist primarily of uplands. The topography is level to rolling, with some areas sloping to steeply sloping. Mixed shrub grass habitat dominates the area. This habitat is characterized by level ground to rolling hills that are well vegetated. Ponderosa pine and rough breaks habitats also occur within the general area. All streams on the study area are ephemeral or perennial. Several ponds exist on the PSO Tract, with all of them being stockponds. Ponderosa pine trees exist on the foothills and steep rocky slopes of the proposed exchange area.

3.4.10.2 Big Game

Three big game species occur in the vicinity of the PSO Tract area: pronghorn (Antilocapra americana), mule deer (Odocoileus hemionus), and white-tailed deer (Odocoileus virginianus). WGFD big game herd unit maps generally show this area is out of the normal white-tailed deer range. The WGFD has classified the tract as yearlong and winter yearlong pronghorn range. The vast majority of the tract is classified as winter yearlong deer range. No crucial big game habitat or migration corridors are recognized by the WGFD for this area.

Pronghorn are, by far, the most common big game species in the area. The study area is within the Clearmont Herd Unit with approximately 1000 acres within yearlong range and the remaining 1045 acres within winter-yearlong range. None of the study area or other areas within two miles have been classified as crucial or critical pronghorn habitat. The yearly big game monitoring surveys completed for the adjacent PSO No. 1/Ash Creek Mine also covered a majority of the proposed exchange area. The PSO No. 1/Ash Creek Mine surveys indicated that pronghorn were not abundant on the area during the

spring, summer or fall but frequented the site in normal winters and moved out of the area in harsh winters when deep snows accumulated on the site.

The PSO Tract area is located within the northeastern portion of the WGFD North Bighorn Mule Deer Herd Unit. The WGFD maps show the PSO Tract area is totally within winter yearlong mule deer range. Crucial or critical mule deer ranges do not occur on or within several miles of the PSO Tract area. The PSO No. 1/Ash Creek Mine surveys indicated the area is a yearlong use area and mule deer are scattered throughout the site and do not concentrate on the area during any particular season.

White-tailed deer are uncommonly observed on the PSO Tract area which is within the WGFD Powder River White-tailed Deer Herd Unit. The site is generally considered out of normal white-tailed deer range but the WGFD classified the adjacent areas associated with Ash Creek and Little Youngs Creek as yearlong habitat. No crucial white-tailed deer range exists within several miles of the PSO Tract area.

3.4.10.3 Other Mammals

A variety of small and medium-sized mammal species occur in the vicinity of the PSO Tract area. These include predators and furbearers, such as coyote (Canis latrans), red fox (Vulpes vulpes), striped skunk (Mephitis mephitis) and raccoon (Procyon lotor). Prey species include rodents such as mice, voles, chipmunks and black-tailed prairie dogs (Cynomys ludovicianus) and lagomorphs (jackrabbits and cottontails). These species are cyclically common and widespread throughout the region. They are important prey items for raptors and other predators. Surveys for prairie dog towns were conducted on the PSO Tract area and adjacent lands. Several small prairie dog towns were observed on the PSO Tract area. These prairie dog towns are located in the NE¼ of Section 21, the NW¼ of Section 22, the SE¼ of Section 20, the NE¼ of Section 29 and the NW¼ of Section 27, T.58N., R.84N. (Figure 3-8). Several other prairie dog towns are known to exist within several miles of the PSO Tract area.

The black bear (Ursus americanus) and mountain lion (Felis concolor) have been recorded in the area but are not common.

3.4.10.4 Raptors

Numerous raptor species have been observed on or adjacent to the PSO Tract area. These species include the golden eagle (Aquila chrysaetos), bald eagle (Haliaeetus leucocephalus), northern harrier (Circus cyaneus),Swainson's hawk (Buteo swainsoni), red-tailed hawk (Buteo jamaicensis), ferruginous hawk (Buteo regalis), rough-legged hawk (Buteo lagopus), prairie falcon (Falco mexicanus), Cooper's hawk (Accipiter cooperii), American kestrel (Falco sparverius), turkey vulture (Carthartes aura), great horned owl (Bubo virginianus), short-eared owl (Asio flammeus) and burrowing owl (Athene cunicularia). Figure 3-8

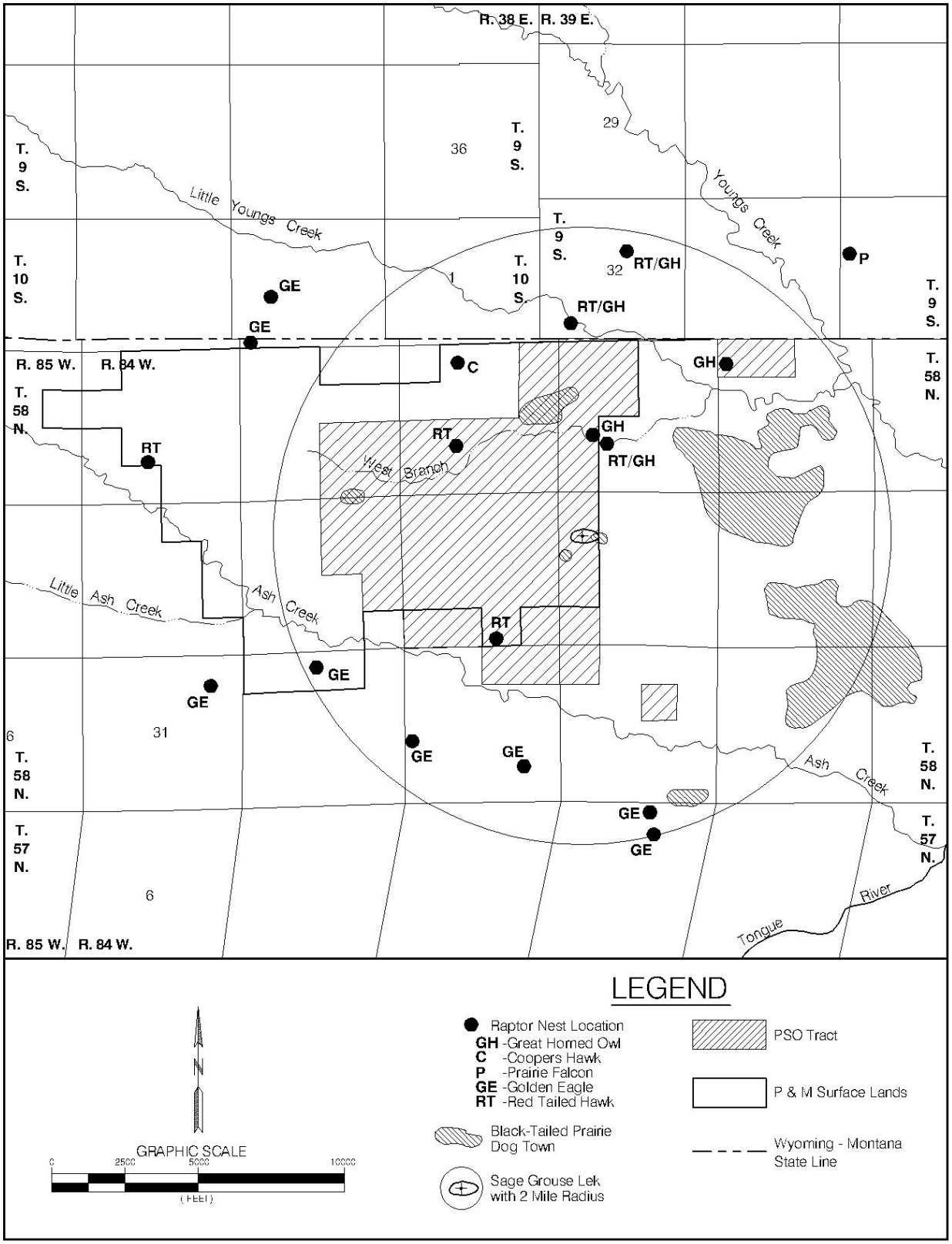



Figure 3-8. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the PSO Tract.

shows the locations of intact raptor nest sites that have been identified since monitoring began for PSO No. 1 Mine, which includes most of the PSO Tract area. A total of six raptor species have been identified nesting within one mile of the PSO Tract area. These species include the great horned owl, red-tailed hawk, golden eagle, prairie falcon, Cooper's hawk and American kestrel. In 2001, only six nest sites were active and included two golden eagle nests, three red-tailed hawk nests and one great horned owl nest. An undetermined number of American kestrel nests were active.

Only two raptor species have been recorded nesting on the actual federal coal lands being considered for trade. The red-tailed hawk and great horned owl successfully fledged young on the site in 2001.

3.4.10.5 Game Birds

Several upland game bird species have been observed on the PSO Tract area or adjacent lands, including sage grouse (Centrocercus urophasianus), sharp-tailed grouse (Tympanuchus phasianellus), migratory mourning doves (Zenaida macroura), wild turkey (Meleagris gallopavo), pheasant (Phasianus colchicus) and gray partridge (Perdix perdix). The mourning dove only inhabits the area for breeding and reproduction from late spring to early fall.

The sage grouse is a yearlong resident and was found on the PSO Tract area. Sage grouse lek surveys in April and May of 2001 identified an active sage grouse strutting ground within the federal coal lands being considered for trade. Figure 3-8 shows the location of this active lek. The two mile radius from this lek, which research identified as the area in which most hens would nest, covers most of the federal coal lands being considered for trade. The lek is located in the NW¼ of Section 27, T.58N., R.84W. This particular lek was active intermittently from 1979 through 2001 with the maximum number of males recorded at 31 in 1982.

The sharp-tailed grouse is a yearlong resident and was also found on the Tract. Several sharp-tailed grouse lek sites have been recorded in the past but these leks were inconsistently used and none were consistently active in 2001.

The wild turkey and pheasant were commonly encountered on the area while the gray partridge was uncommon.

3.4.10.6 Migratory Birds of High Federal Interest

Table 3-7 provides a list of the MBHFI species that may occur on the PSO Tract or disturbance areas. Nine MBHFI species have been documented in the area. The northern harrier nests in the area, generally using ground nests. The ferruginous hawk nests in the region but has not been recorded nesting within one mile of the PSO Tract. The other MBHFI species observed on the area were recorded as migrants or foraging in the area, and nesting

Table 3-7. MBHFI Status in Northeast Wyoming and Expected Occurrence on or near the PSO Tract (USFWS 1995).

| Species | Seasonal Status/Breeding Records in NE Wyoming[1] | Documented on or near the PSO Tract | Expected on the PSO Tract |
|---|---|---|---|
| Common Loon | Summer/nonbreeder | No | Uncommon |
| American Bittern | Summer/nonbreeder | No | Uncommon |
| White-faced Ibis | Summer/nonbreeder | No | Uncommon |
| Northern Harrier | Summer/breeder | Yes | Common |
| Northern Goshawk | Summer/breeder | No | Uncommon |
| Ferruginous Hawk | Summer/breeder | Yes | Uncommon |
| Mountain Plover | Resident/breeder | No | Uncommon |
| Upland Sandpiper | Summer/breeder | Yes | Uncommon |
| Long-billed Curlew | Resident/breeder | Yes | Uncommon |
| Black Tern | Resident/breeder | No | Uncommon |
| Barn Owl | Never recorded | No | Very rare |
| Burrowing Owl | Summer/breeder | Yes | Uncommon |
| Short-eared Owl | Summer/breeder | No | Uncommon |
| Red-headed woodpecker | Summer/breeder | Yes | Uncommon |
| Very | Summer/breeder | No | Uncommon |
| Loggerhead Shrike | Summer/breeder | Yes | Common |
| Dickcissel | Summer/breeder | No | Rare |
| Cassin's Sparrow | Summer/breeder | No | Rare |
| Baird's Sparrow | Summer/breeder | No | Uncommon |
| Brewer's Sparrow | Summer/breeder | Yes | Common |
| Lark Bunting | Summer/breeder | Yes | Common |
| Grasshopper Sparrow | Summer/breeder | No | Uncommon |
| McCown's Longspur | Summer/breeder | No | Uncommon |
| Chestnut-collared Longspur | Summer/breeder | No | Uncommon |

[1] Complied from Oakleaf et al. (1997). Includes Sheridan County and adjacent counties.

habitat for several of those species occurs on the site.

The Lewis' woodpecker (Melanerpes lewis) was formerly listed as a MBHFI species of concern for this specific area. This species was subsequently removed from the MBHFI list due to identification of individuals using numerous other sites within the region and state and the relatively good abundance of birds and habitat.

3.4.10.7 Other Species

Wildlife surveys completed specifically for the PSO Tract, and surveys completed for the PSO No. 1/Ash Creek Mine, have documented numerous other wildlife species that inhabit the area. All of these species were generally common inhabitants of the area and none were of specific concern to state or federal agencies. The other species observed include nine carnivores, 14 rodents, two lagomorphs, 16 waterbirds, 11 raptors, 65 other bird species, 10 herptiles and three fish species.

Under current natural conditions the PSO Tract provides limited waterfowl and shorebird habitat. This habitat is primarily provided during spring migration as ponds and streams, most of which generally dry up during the summer. Ash Creek, a perennial stream adjacent to the southern part of the PSO Tract area, can sustain limited waterfowl and shorebird populations in a very wet year. Ash Creek is typically used for irrigation purposes by the local ranchers, which in turn creates limited habitat for waterfowl and shorebirds upon these irrigated hay fields. With the addition of water being produced from CBM wells in the area, an increase in habitat for waterfowl and shorebirds will occur along all stream channels. Waterfowl and shorebird species would use the isolated ponds and drainages filled by the CBM wells if sufficient water is established.

Fish species may be found in Ash Creek, Youngs Creek, and Little Youngs Creek, as these are perennial water sources. Little Youngs Creek may go dry for prolonged periods of time during very dry years. Fish habitat may also be created and enhanced from CBM water discharges.

3.4.10.8 Threatened, Endangered and Candidate Animal Species

See Appendix C for discussion of threatened, endangered, and sensitive species that have been identified as potentially present on the PSO Tract

3.4.11 Ownership and Use of Land

The surface on the federal coal being considered for exchange is owned by the Chevron Corporation (P&M), Bluegrass Coal Development, Reserve Coal Properties Company, Flying V Cattle Company/D.S. Scott/Padlock Ranch, Neil DeLapp, and the Federal government (Figure 3-9). The principal land use within the tract is domestic grazing and wildlife habitat.

Areas of surface disturbance on the federal coal lands being considered for exchange are off road, two-track

vehicle trails associated with livestock management activities and the disturbance associated with the five CBM wells that have been drilled and the potential disturbance with the four CBM wells that are proposed. Two county roads, the Ash Creek Road and the Youngs Creek Road, pass briefly along the edges of the federal coal lands (Figure 3-9).

The oil and gas rights within the boundary of the federal coal being considered for exchange are both federally and privately owned (Figure 3-10). The majority (about 77 percent) are private. The federally owned oil and gas rights included in the tract are leased, and a list of the lessees of record for those federal oil and gas leases is included as Table 3-8.

WOGCC records show that no conventional oil and gas wells have been completed on the federal coal lands being considered for exchange. As discussed in Section 3.4.3, there is nearby production in the Ash Creek and Ash Creek South Oil Fields, which are located in T.10S., R.38E., Section 3, Big Horn County Montana, and in T. 58N., R.84W., Sections 29, 30, 31, and 32, Sheridan County, Wyoming. These two fields, which were discovered in 1952, have produced approximately 1.7 million barrels of oil and 27 million barrels of water. Most of the wells have been plugged and abandoned. Presently there are six wells completed in conventional oil reservoirs that are still producing; one in Section 29 (SW¼SW¼), two in Section 30 (SE¼SE¼ and SW¼SE¼), two in Section 31 (NE¼NE¼ and NW¼SE¼), and one in Section 32 (NW¼NW¼). No conventional oil field support facilities for the Ash Creek and Ash Creek South Oil Fields are located within the boundary of the federal coal lands being considered for exchange.

The Supreme Court has ruled that the CBM rights belong to the owner of the oil and gas rights (98-830). Therefore, the oil and gas lessees have the mineral rights to develop the CBM in the coal as well as the right to develop conventional oil and gas on the tract.

CBM is currently being produced adjacent to the PSO Tract. The approved well spacing pattern is one well per coal seam per 80 acres for development of CBM resources in the PRB. There would potentially be 78 CBM well locations on the federal coal lands being considered for exchange if all of the 80-acre spacing units within the tract are drilled and completed in all of the potential coal beds. CBM development has been accelerating rapidly within and adjacent to the federal coal lands being considered for exchange since 1999. A search of the WOGCC records in July 2001 revealed that there were 147 CBM wells completed or permitted to be drilled within T.58N., R.84W. All CBM wells existing within T.58N., R.84W. at that time were drilled in 2000 and 2001, and none were yet in production. In addition, five CBM wells had been drilled and four were permitted to be drilled within the boundary of the federal coal being considered for

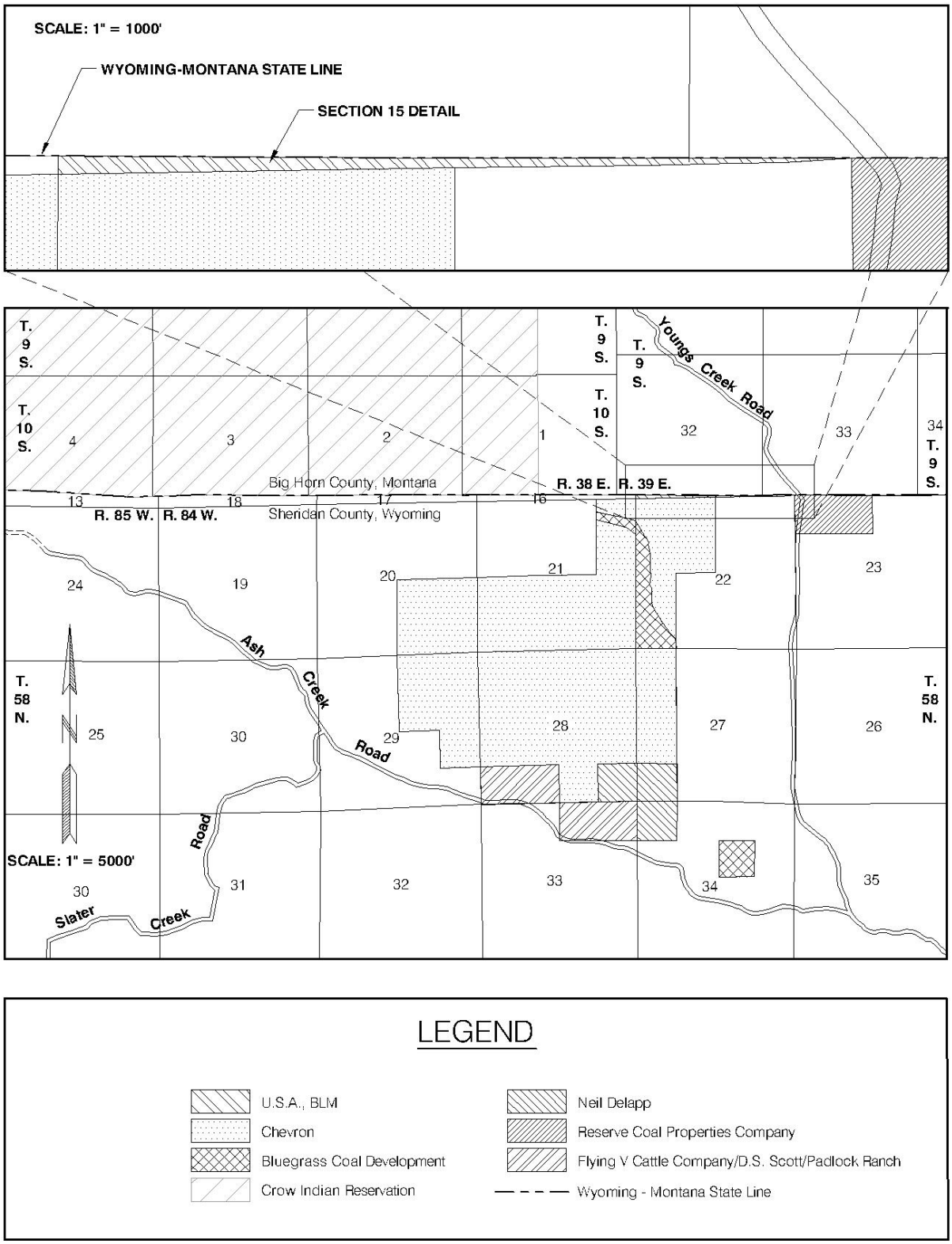



Figure 3-9. Surface Ownership Within the Boundary of the PSO Tract.

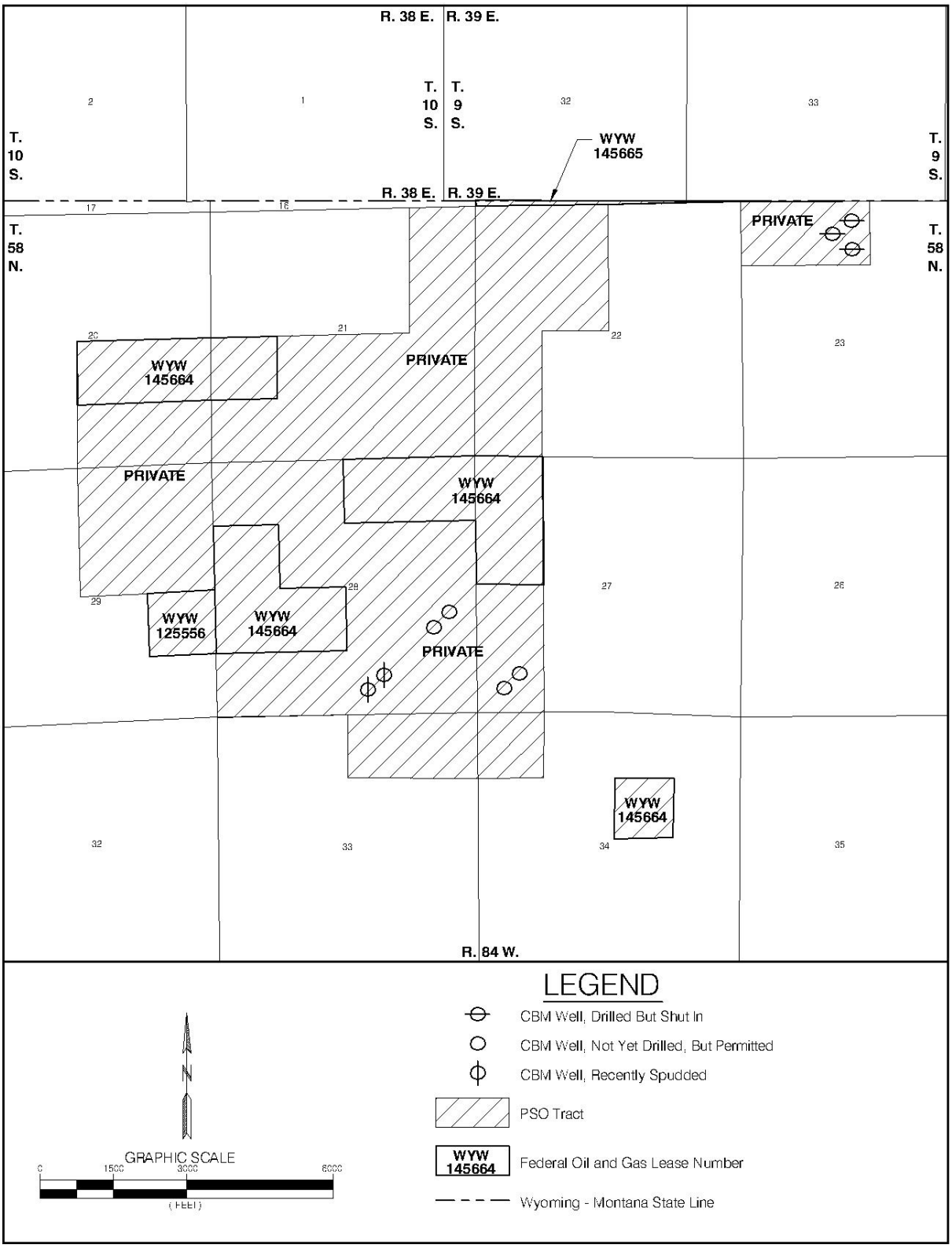



Figure 3-10. Oil and Gas Ownership Within the Boundary of the PSO Tract.

Table 3-8. Oil and Gas Ownership on the Federal Coal Lands Being Considered for Exchange.

For the following locations, both the oil and gas rights (including coal bed methane) and coal rights are owned by the federal government.

| Location T. 58 N., R. 84 W. | Lease Number | Expiration Date | Lessees of Record |
|---|---|---|---|
| Section 15<br>Lot 1 | WYW 145665 | 7/31/2008 | Louis S. Madrid Trust |
| Section 20<br>NE¼SE¼,<br>NW¼SE¼<br><br>Section 21<br>NW¼SW¼<br><br>Section 27<br>NW¼NW¼,<br>SW¼NW¼<br><br>Section 28<br>NE¼NE¼,<br>NW¼NE¼,<br>SW¼NW¼,<br>NW¼SW¼,<br>SW¼SW¼<br><br>Section 34<br>SW¼NE¼ | WYW 145664 | 7/31/2008 | J.M. Huber Corp. |
| Section 29<br>NE¼SE¼ | WYW 125556 | 10/31/2001 | ABO Petro Corp.<br>Myco Industries Inc.<br>Yates Drilling Co. |

Note: For the rest of the federal coal lands being considered for exchange, the oil and gas rights (including CBM) are privately owned. All of the coal rights are federally owned.

exchange (Figure 3-10). A concurrent search of the Montana BOGC revealed that there were no CBM wells within T.10S., R.38E. but 67 CBM wells have been completed within three miles of the federal coal lands since 1999 and 60 are currently in production. As new CBM wells are drilled and completed on or adjacent to the PSO Tract, facilities (i.e., pipelines and compressor stations) would be constructed to produce and transport the CBM and the associated produced water.

Coal mining has been and continues to be a significant land use in the general area of the PSO Tract. The thick Fort Union coal deposits present in the Sheridan coal field have been mined extensively by either underground or surface mining methods along the Tongue River since the late 1800s. Most of the old underground mines were located near the confluence of Goose Creek and Tongue River, roughly four miles south of the PSO Tract (Figure 3-1). Underground mining continued on a fairly large scale into the 1940s. All underground mine portals were sealed by 1953. With the introduction of heavy equipment and the advent of surface mining techniques the first strip mine, locally called the Hidden Water pits, opened in Sheridan County in 1944. Mining was discontinued there in the early 1950s but the pits remained open until 1985 when final reclamation was completed with Abandoned Mine Land funds. This reclaimed surface mine (called "Old Surface Coal Mine" on Figure 3-1) is located about two miles southwest of the PSO Tract.

Surface mining at the Big Horn Coal Mine, located at the confluence of Goose Creek and Tongue River, about four miles south of the PSO Tract, began in 1951. Big Horn Coal Mine's nearest pit was about two miles south of the PSO Tract. Annual coal production from the Big Horn Coal Mine peaked in 1981 at four million tons and ended in 2000 with 38,411 tons. All coal production from Sheridan County ended with the final reclamation of the Big Horn Coal Mine in 2000. As stated previously, the PSO No. 1/Ash Creek Mine was opened in 1976 and reclaimed in 1996 after producing no coal.

Two active surface coal mining operations in Big Horn County, Montana, the Decker Coal Mine and the Spring Creek Coal Mine, are located approximately six miles and seven and one-half miles, respectively, northeast of the PSO Tract (Figure 3-1). The West Decker mine was opened in 1972, the East Decker mine was opened in 1977, and the Spring Creek mine was opened in 1979. Both the Decker and Spring Creek mines are currently producing around 11 million tons of coal annually.

According to the *Sheridan County Growth Management Plan* (City of Sheridan 2001), the designated zoning classification for the PSO Tract is agricultural. This Comprehensive Master Plan for Sheridan and Sheridan County provides no general or specific land use goals or policies for state and federal coal leases in the county.

Big game hunting is the principal recreational use in the analysis area. The surface estate within the PRB is largely privately owned (approximately 80 percent), with some private landowners permitting sportsmen to cross and/or hunt on their land. Others charge an access fee, and some do not allow any access. There has been a trend over the past two decades towards a substantial reduction in lands open and reasonably available for hunting. Access fees continue to rise and many resident hunters feel these access fees are unreasonable. This trend has created problems for the WGFD in their attempt to distribute and control harvest at optimal levels, as well as to sportsmen who desire access to these animals (WGFD 1996). Due to safety concerns, public lands contained within an active mining area are often closed to the public, further limiting recreational use. In the PRB, the 20 percent of the surface estate that is administered by BLM or USFS or the State of Wyoming is generally open to hunting if legal access is available. State school sections are normally Sections 16 and 36 of each township.

The surface of all of the lands within the boundary of the federal coal being considered for exchange, with the exception of the 6.41 acres that comprise all of Section 15, T.58N., R.84W., is currently privately owned (Figure 3-9) and recreational use is allowed only with landowner permission. P&M does not allow sport hunting on the PSO Tract.

Pronghorn, mule deer, and white-tailed deer occur on and adjacent to the PSO Tract. Sage grouse, sharp-tailed grouse, mourning dove, waterfowl, rabbit, racoon, and coyote may also be harvested in the vicinity, and some trapping of red fox may occur. No sport fisheries exist on the PSO Tract.

Specific details regarding big game herd management objectives in the project area are contained in the *Casper and Sheridan Region Annual Big Game Herd Unit Reports* (WGFD 2000).

The WGFD classifies the PSO Tract as yearlong habitat for antelope with none of the tract or areas within two miles adjacent classified as crucial or critical pronghorn habitat. Big game surveys conducted for the PSO No. 1/Ash Creek Mine have indicated that pronghorn are not abundant on the area during the spring, summer or fall, but frequented the site in normal winters and moved out of the area in harsh winters when deep snow accumulates. The PSO Tract area is within pronghorn antelope Hunt Area 15, which is contained in the WGFD Clearmont Pronghorn Antelope Herd Unit.

The Clearmont Herd is not a distinct unit as antelope are able to move in and out between Wyoming and Montana, as well as neighboring herd units to the south and east. The post-season population management objective for this herd was set in 1983 at 3,000 pronghorn. While the population is currently estimated to be above this objective, it is still below

historic levels. The herd suffered substantial losses during the 1993-94 and 1996-97 winters, accompanied by poor fawn production and adult recruitment in 1994 and 1997. Favorable environmental conditions and improved fawn production over the past three years has resulted in an increased population. Nevertheless, WGFD personnel, hunters, and landowners have noticed a decline in the actual number of antelope over the past decade. Landowners and hunters have expressed a desire for more antelope in this herd unit. The desired level does not necessarily correspond to the established post-season population management objective. Landowners have restricted hunter access due to decreased population levels. Most of the herd unit is private land (87 percent) with limited hunter access opportunities. Most landowners who allow hunting either charge access fees or lease their property for hunting. As a result there has been a steady decline in the number of resident hunters, as they are often reluctant to pay access fees. While all 300 licenses sold for this herd unit, only 79 percent of resident license holders hunted compared to 95 percent of nonresident license holders. This suggests very restricted access for resident license holders. WGFD realizes that the population objective for this herd unit is unrealistic and it is scheduled for review in January 2002.

In 2000, hunters experienced significantly lower success and higher effort while hunting in this herd unit. In the years 1996 – 2000, hunters on average harvested about 254 pronghorn per year, which is about 67 percent below the previous five-year mean (1990 - 1995). In 2000, an estimated 267 hunters harvested an estimated 184 antelope from this herd unit, with about 69 percent success, up slightly from 1999, but considerably below the previous five-year average. WGFD anticipates a similar harvest for 2001.

WGFD predicts that the Clearmont Herd population will likely stabilize or decrease over the next year due to the effects of drought and normal to above normal winter conditions. There were several wild fires within the herd unit boundary during the summer and fall of 2000 and 2001 that will likely influence over-winter survival. CBM development is occurring in a large portion of this herd unit. Impacts are unknown at this time, although increased roads, water discharge, vegetation disturbance and human presence would likely have some adverse impacts to this population.

The PSO Tract area is located within the northeastern portion of the WGFD North Bighorn Mule Deer Herd Unit. The WGFD maps show the federal coal lands being considered for exchange are totally within winter mule deer range. Crucial or critical mule deer ranges do not occur on or within several miles of the PSO Tract. Big game surveys conducted for the PSO No. 1 Mine have indicated that area is a yearlong use area and mule deer are scattered throughout the site and do not concentrate on the PSO

Tract area during any particular season. The PSO Tract is in mule deer Hunt Area 166, part of the North Bighorn Mule Deer Herd Unit, which also includes Hunt Areas 24, 25, 27, 28, 50, 51, 53, and 159. Beginning with the 2001 hunting season, hunt area 166 will be eliminated and the area will be recombined with hunt area 24. Area 166 was created from part of hunt area 24 in 1988. The North Bighorn Mule Deer Herd Unit encompasses approximately 2,568 $mi^2$, much of which is public land managed by the USFS and the BLM, although Hunt Areas 24 and 166 contain predominantly private lands with limited hunting opportunities, especially for resident hunters. Private lands are fairly restrictive and access fees are common, resulting in high hunting pressure on public lands. In 2000, 1,918 mule deer were harvested from the North Bighorn Mule Deer Herd Unit by an estimated 2,774 resident and 1,945 non-resident hunters. Hunter success was 41 percent overall, up slightly from 1999. Resident hunter success (27.2 percent) is considerably less than non-resident success (59.1 percent) and resident effort (15.7 days per hunt) was still considerably higher than nonresident effort (7.1 days per hunt), suggesting a decrease in deer numbers on public lands where residents generally have access to hunt.

Since 1996 the post-season population management objective for the North Bighorn Mule Deer Herd Unit has been 25,000. WGFD's 2000 post-season population estimate of 20,300 is about 19 percent below the desired objective. Management in most of the herd is to increase deer numbers, and the 2001 post-season population is estimated to increase to about 21,600 deer. Continued harvest strategies are designed to maintain this herd near the current population.

White-tailed deer are uncommonly observed on the PSO Tract area which is within the WGFD Powder River White-tailed Deer Herd Unit. The site is generally considered to be out of normal white-tailed deer range, but the WGFD classified the adjacent areas associated with Ash Creek and Little Youngs Creek as yearlong habitat. No crucial white-tailed deer range exists within several miles of the PSO Tract area. The PSO Tract are in white-tailed deer Hunt Area 166, part of the Powder River White-tailed Deer Herd Unit, which encompasses a large portion of north-central Wyoming and also includes Hunt Areas 17, 19, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 163, and169. The Powder River White-tailed Deer Herd Unit contains 8,610 $mi^2$ total area, but only about 880 $mi^2$ (10 percent) is considered occupied habitat. Most white-tailed deer are found along riparian areas, agricultural lands and mountain shrub communities, the majority of which are on private lands. Private lands make up about 88 percent of the delineated occupied land. WGFD's management strategy for white-tailed deer is to manage numbers based on landowner tolerance and access. Urban development is a major problem with white-tailed deer management in

Sheridan County. Subdivisions in Sheridan County are generally in areas currently inhabited by whitetails. In 2000, 2,708 white-tailed deer were harvested from this herd unit, an increase of about 1,000 animals from 1999 by an estimated 3,508 resident and 1,047 non-resident hunters. The population objective for this herd unit is 8,000 deer. Generally, the population of white-tailed deer has been expanding during the past several years and it is estimated that the herd exceeded the objective by as much as 100 percent during recent years. Harvest strategies are designed to limit the growth of this herd unit, although WGFD feels that they will not be able to reduce this population to objective with only harvest.

### 3.4.12 Cultural Resources

Cultural resources are defined as the physical remains of past human activity, generally inclusive of all manifestations more than fifty years old. Cultural resources can be classified as artifacts, features, sites, districts or landscapes. The goal of cultural resource management is the conservation of archaeological and historical remains and information for research, public interpretation and enjoyment, and for appreciation by future generations.

Prehistoric resources are physical locations with remains that are the result of human activities occurring prior to written records. Historic resources are remains left by human activity after written records were common. These resources are most commonly recorded as sites: clusters of artifacts and/or features with definable boundaries, or as isolated artifacts. Cultural resources, both historic and prehistoric, are often termed "historic properties" in regulatory literature.

#### Environment

The study area for heritage resources encompasses an area of approximately 3,520 acres which is privately owned by P&M. The study area is about 10 air miles north of Sheridan, Wyoming, just south of the Montana border. It is encompassed by an area about 2.25 miles north-south by 4.75 miles east-west. The study area lies within the watersheds of Ash Creek and Little Youngs Creek, both tributaries of the Tongue River. The area lies on the southern edge of what archaeologists refer to as the "Pine Breaks" region, an area which extends roughly from the Musselshell River in central Montana southeastward to the western foothills of the Black Hills. The Pine Breaks has been distinguished from neighboring areas on the plains by its more rugged topography, a relatively abundant fuel and water supply, and by its more diverse ecology which provides a variety of opportunities for resource procurement (Fredlund 1981a). The drainages have riparian environments with a wide variety of flora. The uplands area includes patches of open grassland and ponderosa pine forest. A geological phenomenon, important to archaeology in the Pine Breaks, is the abundance of the lithic material *porcellanite*, created by underground

coal fires which thermally metamorphosed surrounding shales and sandstones. Porcellanite is by far the most abundant lithic material encountered in the region and was widely used for stone tool manufacture.

Sandstone from the Tongue River member of the Fort Union Formation is exposed in several places within the project area. The sandstone outcrops commonly form small bluffs along the steeper slopes. In places, cavities have been weathered into the sandstone, creating small shelters. Sandstone outcrops in the area are also associated with prehistoric rock art, including petroglyphs (carvings) and pictographs (paintings).

Existing Cultural Resources Inventory

A Class III cultural resources survey is a professionally conducted, intensive inventory of a target area, designed to locate all cultural properties which have surface and exposed profile indications. Cultural properties are recorded and sufficient information collected on them to allow evaluation for possible inclusion in the NRHP. That determination is made by the managing federal agency in consultation with SHPO. Consultation with SHPO must be completed prior to approval of the MLA mining plan.

Once a Class III survey is completed, site-specific testing or limited excavation is utilized, if necessary, to gather additional data which would: 1) determine the final evaluation status of a site and/or 2) form the basis of additional work that would be conducted during implementation of a treatment plan if the site is eligible for the NRHP. A treatment plan is then developed for those sites that are eligible for the NRHP and are within the area of potential effect. Treatment plans are implemented prior to mining and can include such mitigative measures as avoidance (if possible), large scale excavation, complete recording, Historic American Building Survey/Historic American Engineering Record documentation, archival research, and other acceptable scientific practices.

The goal of the inventory was to locate and evaluate for the NRHP all cultural resources 50 years and older within the study area.

A comprehensive investigation of the cultural resources within the study area which surrounds and encompasses the APE has recently been completed (Ferguson and Meyer 2001). This includes a review of cultural inventories conducted previously in the region as well as a review of pertinent literature and records on the history and prehistory of the area. A great number of cultural resource studies have taken place in the surrounding Pine Breaks Region, primarily in conjunction with coal mining. These studies, undertaken since the 1970s, include a number of inventories very near or intersecting the current study area, along with several studies conducted a few miles to the north, associated with coal mine development near Decker, Montana. Major archaeological reports from the

surrounding area which contain information relevant to the context of local historic and prehistoric resources include: Brumley and Dickerson 2000; Carmichael, et al. 1979; Fox 1977; Fredlund 1977, 1979, 1981b; Gregg 1977a, 1977b, 1978; Haberman 1973; Larhen 1977; Munson 1990; Munson et al. 1992; Munson and Ferguson 1998; and Taylor, et al. 1984.

Additionally, five regional archaeological overviews have been written which provide a generalized background for the area prehistory. Although the current body of archaeological data has rendered some of these overviews somewhat dated, they are presented as general references to the archaeology of the region and include: Beckes and Keyser 1983; Deaver and Deaver 1988; Fredlund 1981a; Frison 1991; and Wettstaed 1989.

Despite the great volume of work that has been done, no overviews adequately synthesize currently available data. Beckes' and Keyser's (1983) overview of the Custer National Forest includes a section on the Ashland Ranger District within the Pine Breaks. However, the incorporated data is confined almost exclusively to National Forest land. Deaver and Deaver's (1988) overview of southeastern Montana includes general information on the Pine Breaks area, with a chronological overview. Both of these studies are somewhat dated in light of subsequent investigations. Fredlund's (1981a) dissertation deals explicitly with the Pine Breaks area, but concentrates only on the Late Prehistoric Period. Benson's Butte is a multicomponent site excavated between 1972 and 1978 and located about 2.2 miles north of the current study area. The results of the excavations are summarized in Fredlund (1979). The site includes components dating from the late Paleoindian to the Late Prehistoric periods. Again, subsequent investigations have rendered some of Fredlund's findings at Benson's Butte out of date.

More recent excavations in the area are reported in Munson (1990), Brumley and Dickerson (2000), and elsewhere. Large scale inventory projects have been conducted immediately north of the current study area in Montana, including Fredlund (1981b) and Gregg (1977a). The reader is referred to the studies referenced above for additional background information.

Cultural resource inventory work, in compliance with regulations established in the 1966 National Historic Preservation Act, 36 CFR Part 800 (BLM Class III level), was conducted in the PSO Tract area, including the APE, in August 2000 (Ferguson and Meyer 2001). The pedestrian inventory covered the terrain at intervals of about 30 meters. Twenty-one sites and fourteen isolated artifacts were located and recorded in the approximately 3,520 acres study area. Two prehistoric sites, 48SH1127 and 48SH1134, found during this inventory are recommended as eligible for the

NRHP under Criterion D. Temporal-cultural affiliations of the recorded sites range in age from Paleoindian to Historic.

3.4.12.1 Prehistoric Resources

Prehistoric sites are classified into cultural/temporal periods based on the types of artifacts, generally projectile points, recovered on-site, and the chronometric dating of the site through techniques such as radiocarbon dating of bone or charcoal extracted from buried features at the sites. Site types are indicative of function or prehistoric activity which occurred at the site and are based on site location, types of artifacts remaining on the site and types of features observed. Cultural periods are given a temporal span, but because of the range and variation of radiocarbon dates, the dates for the beginning and end of a period may vary by several hundred years depending on the researcher and the geographic location of the site. Those given below pertain generally to the Northwestern Plains area as defined by Frison (1991), and may not strictly apply to the Pine Breaks area *per se*. For example, no diagnostic artifacts or radiocarbon dates have been documented in the Pine Breaks for the earliest portion of the Paleoindian period. Late Paleoindian components are present here, but are rare, as they are elsewhere on the Northwestern Plains.

Paleoindian Period

Occupation of the Pine Breaks area has been documented as early as 9,000 years ago (Brumley and Dickerson 2000); however, on adjacent areas of the Northwestern Plains occupation extends back some 12,000 years. This initial settlement of the high steppe environment, the Paleoindian period (12,000 - 8,500 years BP/10,000 BC - 6,500 BC), is characterized by the use of large, well-made lanceolate projectile points and the hunting of large, now-extinct bison, mammoths and other large fauna. Through time the point styles changed and, with the changing climate, the subsistence strategies of the early hunters and gatherers changed as well. The earliest dated human occupation in Wyoming is the Colby site in the Big Horn Basin, which contained Clovis points in association with at least seven mammoths which dated at ca. 9,250 BC. The Hell Gap site is a stratified Paleoindian site in the North Platte drainage which dates from 9,000 BC to 5,500 BC and exhibits changing point types from Goshen through Folsom, Midland, Agate Basin, Hell Gap, Alberta, Cody and Frederick, and ends with a point type known as Lusk. The Carter-Kerr McGee, Agate Basin, Medicine Lodge Creek, Casper and Sister's Hill sites and others are known Paleoindian sites in the Powder River and Bighorn Basins. Paleoindian sites are uncommon due to the passage of time and the erosional and depositional effects of various climatic changes. They are most likely to occur as out-of-context surface finds on stable landforms

such as ridgetops, or deeply buried in depositional settings.

A few Paleoindian manifestations are known in the area. A Hell Gap point was collected from the Chuggy Site, 48SH1134, during the inventory of the current study area (Ferguson and Meyer 2001). Gregg (1977b) reports an isolated Hell Gap projectile point fragment found about 6 miles to the northeast of the study area in the Squirrel Creek watershed. Fredlund (1979) reported Eden, Browns Valley, Frederick and "Agate Basin-like" projectile points recovered from various contexts at the Benson's Butte site, located about 2.2 miles north of the current study area.

The Archaic Period

The Archaic period (8,500 - 1,500 BP/6,500 BC- 500 AD) begins at a time when the climate was becoming generally drier than the present and ends with the climate relatively similar to the climate of today. Few sites are known in the Pine Breaks (Brumley and Dickerson 2000) and adjacent areas that date to the Early Archaic, and these few are characterized by large side-notched dart points (Deaver and Deaver 1988). As the climate stabilized around 3,500 BC, McKean lanceolate points became popular and the overall number of sites in this area increases considerably. This probably reflects a human population increase accompanying a relatively stable climatic cycle and a subsistence base and settlement pattern that changed relatively little over the next 4,000 years. Stone ring features have been dated to this time. Middle Archaic sites seem to be found in all environments. A McKean-Middle Archaic point was found at site 48SH1124 during the Ferguson and Meyer (2001) study.

The Late Archaic appears to mark another increase in the human population. The number of sites known from this period is large and there is a reliance on bison obtained in sophisticated communal kills. Three point types and three cultural complexes characterize this period: Powers-Yonkee, Pelican Lake and Besant. Besant may be a terminal Late Archaic manifestation (i.e., associated with atlatl darts) or Late Prehistoric I manifestation (i.e., associated with the bow and arrow). In addition, Woodland ceramics are occasionally found with Besant, but no pottery is associated with the Powers-Yonkee or Pelican Lake assemblages. Pelican Lake sites are associated with arroyo bison kills and jumps while the Besant people tended to rely on corral systems. Powers-Yonkee points are associated with all three bison procurement methods (Ferguson 1993). Late Archaic sites are generally associated with high landforms with diverse vegetation (ecotones) to maximize the species in the immediate area. A Late Archaic corner-notched point was found at site 48SH1119 during the Ferguson and Meyer (2001) study.

Prehistoric and Protohistoric Periods

The Late Prehistoric period is associated with the common use of the bow and arrow and an increasing

use of ceramics by the local inhabitants. It is also characterized by another increase in the number and size of sites and a wide variety of cultures moving into the area, particularly during the latter part of the period. During the early part of the Late Prehistoric (LPI), small corner-notched points and small, well made, side-notched points called Avonlea are found in the Pine Breaks and extend north from eastern Wyoming into Canada. During the latter part of the Late Prehistoric (LPII), a greater variety of point types and evidence of numerous incursions by other cultural groups into the region appears to be the norm. LPI dates from AD 500 to AD 1,100, and LPII from AD 1,100 to ca. AD 1,800 or upon evidence of Euroamerican contact. A LPI point was found at site 48SH1121 during the Ferguson and Meyer (2001) study.

Whether the increasing number of bison or socio-economic pressures from various geographic areas on the plains was the cause of the influx of tribal groups into the plains, LPII appears to be marked by northern Athabascan groups moving south, Plains Woodland and Upper Republican people moving into the plains from the east and Shoshone moving from the southwest and west. Ethnohistoric and ethnographic information suggests the presence of several tribal groups in the general area at some time during LPII: Crow, Northern Cheyenne, Shoshone, Kiowa, and Kiowa Apache. Correlating historical tribes with archaeological phases or complexes is difficult because of the widely fluctuating character of tribal territories. Reher (1979) developed an elaborate model for the changing cultural history of the area from ca. AD 1,400 to historic times, and the reader is referred to this for more detail on historically known tribal use of the area. An isolated LPII point was found during the Ferguson and Meyer (2001) study.

Prehistoric Site Types

Prehistoric site types represented in the archaeological literature as common to the surrounding region include: lithic workshops; campsites (including the sub-types of open camp, stone circle [tipi ring] site and rock shelter); rock art sites; bison processing sites; kill sites; lithic quarries; surface stone features (including rock alignments, cairns, etc.); vision quest/fasting beds and fortification structures. Of greatest importance to the interpretation of sites (and most difficult to obtain) is information on subsistence, intra-site patterns, seasonality and exact dates of various activities and occupations.

### 3.4.12.2 Historic Resources

Seven sites with historic components were recorded in the study area during the baseline inventory (Ferguson and Meyer 2001). The historic components are related to homesteading or stockherding and date to the period after ca. 1900. Sites with historic components include two homesteads, two cairns, two panels of graffiti, and the remains of a log structure, or possibly a tent platform, associated with either small

scale logging or stock herding. The homesteads were claimed in 1909 and 1916, and neither was occupied for more than a few years (GLO Post-1908 General Land Entry Files; States 2000). No significant historic resources occur within the proposed mine plan area.

Historic Context

The study area is located on the northern edge of Sheridan County, Wyoming, approximately 10 miles north of Sheridan, historically the biggest town in the northern part of the state and the commercial center for the region. Coal mining has long been a central facet of the region's historical development. The study area is about five miles north of the vanished coal mining camps of Monarch, Carneyville (later Kleenburn), and Acme; the interurban railway that connected them in the 1910s and 1920s; and the railway main line of the historic Burlington Route (still operated by BNSF Railroad).

Several geographical contexts apply to the region – the town of Sheridan, the coal mining district, and the county – after the arrival of the railroad in 1892, which led to the period of major settlement, agricultural development, and industrial growth. Previous historical events, such as those related to the Bozeman Trail, the Indian wars of the 1860s and 1870s, and open-range livestock grazing, left few surviving marks on the landscape. Historic resources specific to the study area are limited to agricultural development, ca. 1910s-1940s.

While the arrival of the railroad made the 1890s a time of major change, the following decade saw even greater growth. Between 1900 and 1910 the population of the county more than tripled, from 5,122 to 16,324 (USDC, BC 1913). Coal mining boomed. In the corridor from six miles north to fifteen miles northwest of Sheridan, operators opened several new mines and adjacent camps between 1903 and 1907. To carry passengers and express between Sheridan and the several coal mine camps, an electric interurban railway was built from Sheridan to Monarch, a distance of 11 miles. Completed in 1912, it lasted for 14 years until replaced by busses (Kuzara 1977). Coal mining provided income to the area's farmers. Some found occasional work at the mines or sold timber to the mines for use as props underground.

Agriculture in Sheridan County rapidly expanded from 1900 to 1910. The improved land in farms grew 70 percent, from 55,567 to 95,368 acres. Sheridan County led the state in production of wheat and barley. The harvest of wheat grew 60 percent during the decade and the output of barley tripled (USDI, Census Office 1902; USDC, BC 1913). The growth continued through the 1910s. The major agricultural commodities consisted of livestock (cattle, sheep, and horses), feed crops (hay, oats and barley), wheat and sugar beets. Farmers in the study area could, with one day's round trip travel by team and wagon, easily reach the coal

camps along the interurban and Burlington main line, and with a longer day on the road, get to the town of Sheridan (USDA 1925).

Industrial facilities in Sheridan processed some of the crops grown locally. Of several flour mills, the last and largest ground wheat from 1921 until 1972. A sugar beet refinery operated between 1915 and 1947 (Popovich 1997).

The historic economic activities of the railway and coal mines, with many employees and extensive works, lasted into 1950s. On the railway, the replacement of steam locomotives by diesel-electrics and other modernization greatly reduced the workforce in Sheridan, while traffic actually grew. The last underground coal mine, at Monarch, closed in 1953 (Kuzara 1977). Open-pit mining, begun in 1943, needed far fewer workers to produce greater amounts of coal (Kuzara 1977). The changing economics of agriculture resulted in fewer, larger farms, shipping products to distant plants for processing. While the area still hosts the three economic activities that began on a large scale in the early 1890s – railroading, coal mining, and agriculture – they operate with technology, labor practices, and physical properties that are very different from the historic period.

Vern States first came to this area in 1934 and began buying land here in 1940. He bought three homesteads, including two found in the study area: Baker, Stringary (Negri), and Charles Monsini. His holdings included the whole of the study area. He operated a cattle ranch here until he sold out to an energy developing company in the mid-1970s. Mr. States was interviewed on August 8, 2000, by David Ferguson and provided the following information about the property.

The Monsini place is where Vern built his house (there is no trace remaining of the original homestead). The Monsini family lived in a dugout and had a shack and a hand dug well. Mr. States filled in these features long ago, which were about where the corrals are now. The Frank Baker Place (48SH1138) was bought by Mr. States in the early 1940s. Vern remembers that the Bakers had lived there from about 1905 to 1910, then moved to town after "proving up." The house was burned down to make more room for the hay field. Only the dugout and granary remain. The Stringary place (48SH1130) was abandoned prior to 1934. Stringary proved up and moved to town as well. Vern said it looked about the same then (in the 1940s) as it does now. Vern thought they homesteaded around 1905 but were long gone by 1934.

Mr. States recalls that when he came to this country there were almost no deer at all, as they were heavily hunted to feed the mining community of Acme, as well as the local homesteaders, who he describes as "terribly poor." He recalled that a deer was reported in the area in 1934, and several cow hands from neighboring ranches turned out on

horse back to ride out to try to see it. Merriam's turkeys, now plentiful along the creeks, were introduced in the 1950s. Logging was done on State's property in 1936 and 1937. Logs were skidded by horse team (Ferguson and Meyer 2001).

Table 3-9 summarizes the Class III cultural resource inventory of the PSO Tract study area.

Data recovery plans are required for those sites recommended eligible to the NRHP following testing and consultation with the SHPO. Until consultation with SHPO has occurred and agreement regarding NRHP eligibility has been reached, all sites should be protected from disturbance. Full consultation with SHPO would be completed prior to approval of the mining plan by WDEQ. Those sites determined to be unevaluated or eligible for the NRHP through consultation would receive further protection or treatment.

### 3.4.13 Native American Consultation

Any effects the Proposed Action might have on traditional use and traditional cultural sites of Native Americans must be considered as directed by the National Historic Preservation Act, the American Indian Religious Freedom Act, PL 95-341 and the Archaeological Resources Protection Act of 1979.

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering sites, fasting or vision quest sites and selected rock art sites. Other sites of cultural interest and importance may include rock art sites, stone circles, and various rock features, fortifications or battle sites, burials, as well as locations which are sacred or part of the oral history and heritage that have non man-made features. No Native American heritage sites have been identified to date.

There are presently no documented Native American sacred sites in the general analysis area. However, the position of the area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west and the Black Hills and Devil's Tower to the east) creates the possibility of existing locations which may have special religious or heritage significance to Native American groups.

The study area is immediately south of the Northern Cheyenne and Crow Indian Reservations in Montana. Both groups favored this region in the Protohistoric Period. It is believed that these groups entered the area in the protohistoric period as a result of population movements and technological change. By the time of the earliest Euro-American contacts, horse dependent tribes such as Crow, Sioux, and Cheyenne dominated the region although Shoshonean groups also existed in the region.

Crow emigration from Hidatsa occupations on the Middle Missouri to the upper Yellowstone is well documented (Beckes and Keyser 1983). By the nineteenth century the

Table 3-9. Summary of Class III Cultural Resource Inventory of the PSO Tract Study Area.

| Smithsonian Number | Site Type, Temporal Association, and Description | NRHP status and Criteria |
|---|---|---|
| 48SH1119 | Prehistoric campsite, rockshelter with extensive lithic scatter; Late Archaic projectile collected. Historic graffiti also present. | Not eligible |
| 48SH1120 | Stone circle, prehistoric campsite. | Not eligible |
| 48SH1121 | Lithic scatter, a Late Prehistoric corner-notched projectile point was collected. | Not eligible |
| 48SH1122 | Lithic scatter. | Not eligible |
| 48SH1123 | Lithic scatter. | Not eligible |
| 48SH1124 | Prehistoric cairn and lithic scatter. Middle Archaic Duncan projectile point collected. | Not eligible |
| 48SH1125 | Historic graffiti. | Not eligible |
| 48SH1126 | Stone circle, surface lithic, source, lithic scatter, prehistoric campsite. | Not eligible |
| 48SH1127 | Lithic scatter, prehistoric campsite, Late Plains Archaic bifacial knife collected. Historic debris and possible tent platform also present. | Eligible under Criterion D |
| 48SH1128 | Surface lithic source. | Not eligible |
| 48SH1129 | Prehistoric campsite, stone ring, and lithic scatter. | Not eligible |
| 48SH1130 | Negri/Stringary homestead. | Not eligible |
| 48SH1131 | Prehistoric cairn. | Not eligible |
| 48SH1132 | Lithic scatter. | Not eligible |
| 48SH1133 | Historic cairn. | Not eligible |
| 48SH1134 Chuggy Site | Prehistoric campsite, prehistoric rock art panel, lithic scatter and rockshelter, Paleoindian Hell Gap projectile point. | Eligible under Criterion D |
| 48SH1135 | Historic cairn. | Not eligible |
| 48SH1136 | Surface lithic source, lithic scatter. | Not eligible |
| 48SH1137 | Prehistoric campsite, stone circle, lithic scatter, surface lithic source. | Not eligible |
| 48SH1138 | Baker homestead. | Not eligible |
| 48SH1139 | Surface lithic source, lithic scatter. | Not eligible |

Crow occupied much of southeastern Montana and northcentral Wyoming. Vision quest structures and other traditional sites are known in the Pine Breaks. A variety of plant species of ethnobotanical importance are currently harvested in the general area.

No traditional use sites were positively identified during the archaeological inventory. Several stone circle sites (48SH1120, 48SH1126, 48SH1129 and 48SH1137) and two probable prehistoric cairns (48SH1124 and 48SH1131) were found during the baseline inventory. While these sites can offer little archaeological information, they may be of interest to Native Americans.

Native American tribes were consulted at a general level in 1995-1996 as part of an effort to update the BLM *Buffalo Resource Management Plan*. Tribes that have been potentially identified as having concerns about actions in the Powder River Basin include: the Crow, Northern Cheyenne, Shoshone, Arapaho, Oglala Lakota, Rosebud Sioux, Flandreau Santee Sioux, Santee Sioux, Crow Creek Sioux, Lower Brule Sioux, Standing Rock Sioux, and Cheyenne River Sioux. These tribal governments and representatives were sent scoping notices and will receive copies of the DEIS. Tribal consultation will be conducted to assess the traditional cultural significance of the study area to support an exchange decision on the federal coal.

### 3.4.14 Paleontological Resources

The sedimentary rocks exposed on the surface of the PRB are the Eocene age Wasatch Formation and Paleocene age Fort Union Formation, both of which are known to contain fossil remains. Some paleontological surveys have been conducted in the PRB. Vertebrate fossils that have been described from the Wasatch Formation in the PRB include fish, turtle, champosaur, crocodile, alligator, and mammal specimens. The Fort Union also contains fossils of plants, reptiles, fish, amphibians, and mammals. No Wasatch Formation occurs within the PSO Tract area. No vertebrate-bearing localities have been reported from the Fort Union Formation of the Sheridan coal field or adjacent areas (Lillegraven 1981).

Invertebrate fossils recorded from the vicinity of the Sheridan coal field within the Fort Union Formation appear to be restricted to the Mollusca (Lillegraven 1981). These include freshwater clams (Pelecypoda) and, more commonly, freshwater snails (Gastropoda). Glass' (1975) detailed measured sections of the Fort Union Formation in the Sheridan coal field found no invertebrates.

A paleontological survey of the potential for vertebrate and invertebrate fossils was conducted in 1981 throughout much of the Big Horn Coal Mine area south of the PSO lands area by Jason A. Lillegraven (Professor, Department of Geology and Geophysics, and Curator, Geological Museum,

University of Wyoming). The surveyed lands included approximately 3,280 acres in T.57N., R.84W., Sections 4, 9, 10, 13, 14, and 22-27. At its closest point, Lillegraven's field investigation was less than two miles south of the PSO lands area. Lillegraven reported that only two localities with vertebrate remains were discovered during his survey of the Big Horn Coal Mine area. Both contained only isolated gar pike scales and are without scientific consequence. Only one complete invertebrate fossil was discovered, that being an isolated shell of a snail. The same general area had some poorly-preserved bits of clam shells. There were no indications of abundant accumulations of molluscan fossils, and the few specimens found were judged to be of no taxonomic, stratigraphic, or ecologic consequence. Within his conclusion, Lillegraven stated that there is little probability that important vertebrate or invertebrate paleontological resources exist in the area.

### 3.4.15 Visual Resources

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. The landscape within the general analysis area is described as somewhat rugged topography consisting of dissected uplands created by the Ash Creek and Youngs Creek drainages. The ephemeral tributaries of these perennial streams have formed numerous, steeply sloping ravines that are separated by rounded uplands. The ravines are forested with scattered ponderosa pine and juniper trees, and the gently-rolling upland benches are covered with patches of open grassland and sagebrush. Small bluffs and ledges of resistant sandstone and scoria outcrops occur intermittently along the steeper slopes of the ravines and the sides of the larger valleys. The drainages of Ash Creek and Youngs Creek have relatively lush riparian environments. This type of topography is common within the Pine Breaks region of the PRB.

None of the existing or reclaimed surface mines in the Sheridan coal field are visible from the general analysis area. Major man-made intrusions include ranching activities (i.e., fences, ranch houses and associated structures, homesteads, livestock), transportation facilities, electrical power lines, and recent CBM development activities. The Ash Creek oil field is nearby and accessed by the Ash Creek Road, although the rugged topography, forested ravines, hay meadows and deciduous trees in the Ash Creek valley block the view of the oil field from the road.

The PSO Tract area is only partially visible from Wyoming State Highway 338 and a high percentage of people traveling this highway are commuting to work at the Decker and Spring Creek coal mines. However, during periods of peak recreational activity, primarily to and from the Tongue River Reservoir, this highway receives higher traffic volume. The PSO Tract area lies adjacent to the Ash Creek and Youngs Creek roads (Figure 3-11)

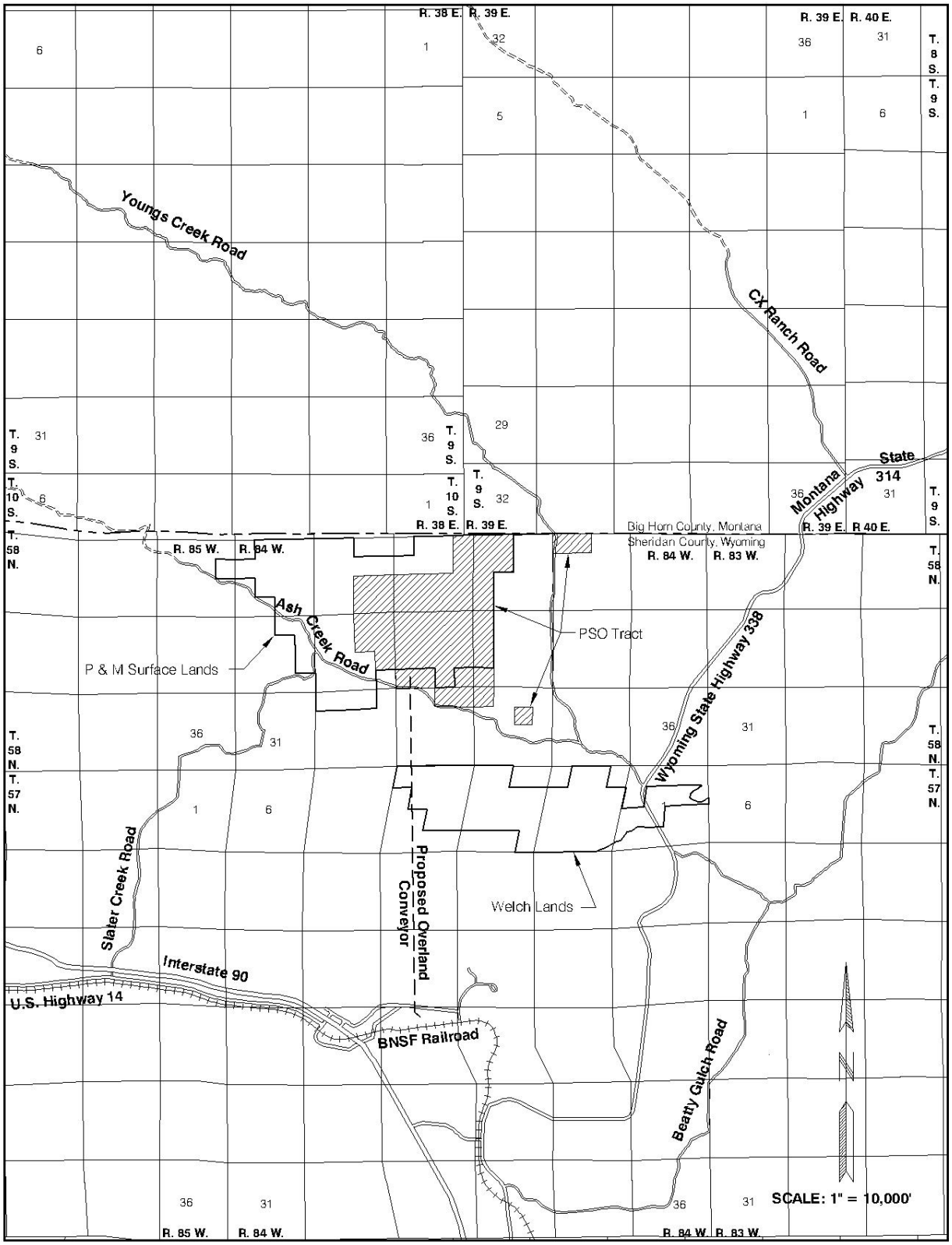



Figure 3-11. Transportation Facilities Within and Adjacent to the PSO Tract.

and is therefore plainly visible to passers-by. Those traveling these improved, aggregate-surfaced roads are typically local residents and the traffic volume is light. The natural scenic quality of the general analysis area is fairly high due to the relatively unaltered condition of the rugged topography and native vegetation, yet it is predominantly hidden from the view of the general public.

For management purposes, BLM evaluated the visual resources on lands under its jurisdiction in the *Buffalo Resource Management Plan*. A VRM inventory identifies, sets, and meets objectives for the maintenance of scenic values and visual quality based on research designed to objectively assess aesthetic qualities of the landscape. The VRM classification ratings range from I to V as follows:

Class I - Natural ecologic changes and very limited management activity is allowed. Any contrast (activity) within this class must not attract attention.

Class II - Changes in any of the basic elements (form, line, color, texture) caused by an activity should not be evident in the landscape.

Class III - Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.

Class IV - Activity attracts attention and is a dominant feature of the landscape in terms of scale.

Class V - This classification is applied to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

The federal coal lands being considered for exchange are generally classified as VRM Class II. After the surface has been reclaimed the visual impact of coal mining would not likely be discernible to the average observer.

### 3.4.16 Noise

An individual's judgement of the loudness of a noise correlates well with the A-weighted sound level, or A-scale, system of measurement. Figure 3-12 presents dBA readings for some commonly heard sounds of daily life.

Existing noise sources in the PSO lands area include activities associated with agriculture, CBM development, local traffic on the Ash Creek and Youngs Creek Roads, intermittent oil well servicing associated with the Ash Creek and Ash Creek South oil fields, and birds and animal life. The distance to State Highway 338 is in excess of three miles; therefore, highway traffic noise is very slight or non-existent. Due to the isolated, remote nature of the area, the current noise level from all these sources in the PSO lands area

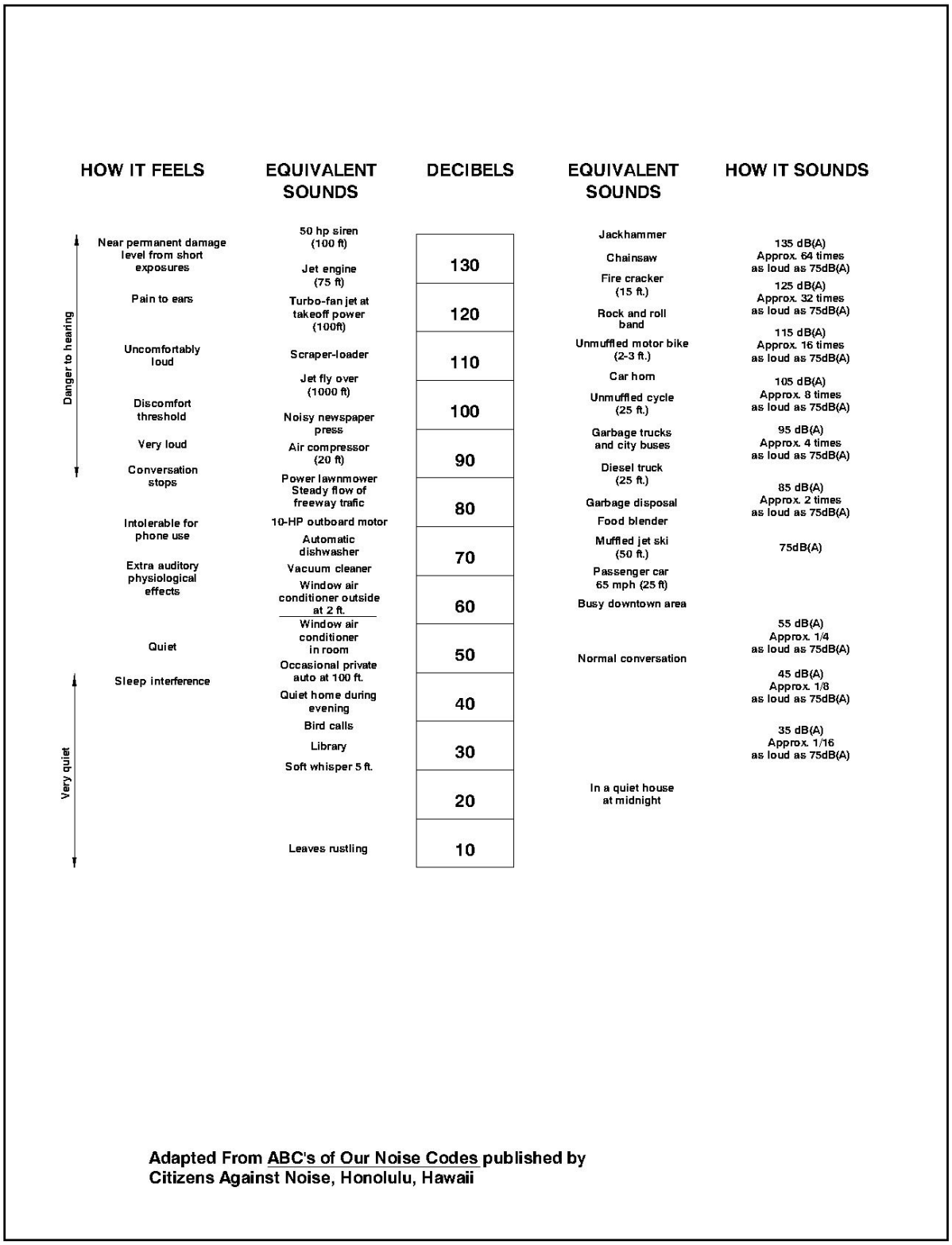



Figure 3-12. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life.

is probably in the range of 30 to 50 dBA.

Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992). The nearest occupied dwellings are all located at a distance of approximately ¼ mile outside of the boundary of the federal coal being considered for exchange. Two of these nearby dwellings are in Montana; one being in the SE¼SE¼ of Section 1, T.10S., R.38E., the other being in the NW¼SE¼ of Section 33, T.9S., R.39E. Three of these nearby dwellings are in Wyoming; one being in the SE¼NW¼ of Section 23, T.58N., R.84W., another being in the NW¼NW¼ of Section 33, T.58N., R. 84W., and the third dwelling being in the NE¼SW¼ of Section 29, T.58N., R.84W.

### 3.4.17 Transportation Facilities

The transportation facilities in the vicinity of the PSO Tract area include Wyoming State Highway 338; the BNSF Railroad; improved county roads including the Ash Creek Road and the Youngs Creek Road; unimproved local roads and two-track trails related to ranching activities, the Ash Creek and Ash Creek South oil fields, and the CBM industry; and numerous pipelines associated with both the conventional oil field and the CBM development.

Current transportation facilities within and adjacent to the PSO Tract lands are depicted on Figure 3-11. Since the development of the Ash Creek Mine would require a coal transportation facility, the proposed 24,000-ft long overland conveyor running due south from the mine to a loadout facility on the BNSF mainline is depicted on this figure.

### 3.4.18 Socioeconomics

The social and economic study area for the proposed project involves primarily Sheridan County and the City of Sheridan. The community of Sheridan and nearby communities of Ranchester and Dayton would most likely attract the majority of any new residents due to their current population levels and the availability of services and shopping amenities.

#### 3.4.18.1 Population

According to 2000 census data, Sheridan County had a population of 26,560, with Sheridan accounting for 15,804 of the county's residents, Ranchester 701 and Dayton 678 (USDC 2001). The 1990 population of Sheridan County was 23,562. Thus there was an increase of 2,998 persons or 12.7 percent over the 10-year period. Sheridan County's population change from 1990 to 2000 ranked 1,158 out of 3,141 counties in the U.S. (U.S. Census Bureau 2001b).

Sheridan County is an area of relatively low growth (1-2 percent per year), and facilities (hospitals, schools, etc.) are adequate. School enrollment is actually declining due to an aging population. The average age in Sheridan County is 40.6 years, compared to a state-wide average of

36.2 (Wyoming Department of Administration and Information July 2001).

3.4.18.2 Local Economy

Coal production, as reported by the Wyoming State Inspector of Mines, showed the State's coal producers set a new yearly production record of 338.9 million tons in 2000. This was an increase of less than 1 percent over the 336.5 million tons produced in 1999, a much slower growth rate than had occurred in recent years. Sheridan County's last remaining coal mine, the Big Horn Coal Mine, closed down and began reclamation in 2000. Its production in 2000 was only 38,411 tons. The Big Horn Coal Mine employed 11 persons in 2000 (Wyoming State Inspector of Mines 2000).

The national economy grew rapidly through the 1990s and is currently in a period of slower growth, due to a variety of factors complicated by higher energy prices. Higher prices for commodities such as coal, oil and gas, and agricultural goods have helped Wyoming's economy as they have hurt the national economy. Recent increases in coal, oil, and gas prices have provided significant increases to state revenues in the form of increased severance taxes, royalties, sales and use taxes, and employment. The mining sector, including oil and gas, is expected to remain strong through at least 2009 (Wyoming Department of Administration and Information April 2001).

Total mineral income to the State of Wyoming in 2000 was $900,441,458. This income was comprised of ad valorem taxes ($290,174,806 or 32 percent), royalty returns $276,720,872 or 31 percent), severance taxes ($275,143,604 or 31 percent) and sales and use taxes, state rent, state royalties, and filing fees ($57,538,838 or 6.4 percent) (Wyoming Business Council 2000).

Mineral valuation in Wyoming in 2000 was $4,075,053,783. This is 52 percent of the state's total valuation and places Wyoming among the top ten mineral producing states in the nation. Sheridan County's mineral valuation in 2000 was only $1,805,204, a fraction of a percent of the state's total (Wyoming Business Council 2000). Minerals accounted for only 1.2 percent of Sheridan County's total assessed valuation in April 2000 of $145,093,161 (Wyoming Department of Revenue 2001).

3.4.18.3 Employment

As of April 2001, the total labor force in Sheridan County stood at 14,172 with an unemployment rate of 3.6 percent, compared to 4.3 percent in April 2000 (Wyoming Department of Employment, Research and Planning 2001b). At the beginning of 1999 around 2,808 people in Wyoming were directly employed in coal mining, representing about 15 percent of the employed labor force (Wyoming Department of Employment 2001b).

Total employment in Sheridan County has generally increased since 1990,

when it stood at 11,416. In April 2001 there were 13,411 employed persons in the county.

In 1997, the largest employment sector in Wyoming was the service sector, with 2,647 employees. This was followed by retail trade (2,295), local government (1,821), construction (760), and federal government (623). Together, these sectors accounted for nearly 80 percent of the county's employment. Mining, which includes oil and gas, employed only 29 persons in Sheridan County in 1997 (Wyoming Department of Employment July 2001).

The preceding statistics obviously do not account for employees at the Decker and Spring Creek Coal Mines. These mines are located in Montana, which receives the payroll taxes, royalties, and production taxes, but most of the employees reside in Sheridan County. In 2000, the Decker and Spring Creek mines employed 235 and 135 people with estimated payrolls of $10,600,000 and $8,900,000, respectively (Montana Coal Council 2001).

Employment in northeastern Wyoming has certainly been affected by the recent CBM development, although state employment experts say it's difficult to track the impact on employment in Sheridan County. Some employers are saying employees leaving for higher paying CBM jobs have left a shortage of quality workers. Large gains in the oil and gas industry were responsible for 4,800 new jobs in Wyoming in April 2001, a growth rate of 21 percent, and the largest state employment gains were in the mining industry with a 12.9 percent increase in jobs from April 2000 to April 2001 (Sheridan County Roundup August 2001).

3.4.18.4 Housing

In 2000, Sheridan County contained 12,577 housing units. Of these, 7,413 were in Sheridan, 304 in Dayton and 290 in Ranchester (U.S. Census Bureau 2001a). Of Sheridan County's 12,577 housing units in 2000, 11,167 were occupied and 1,410 were vacant for seasonal use. Of the 11,167 occupied units, 7,689 were owner occupied and 3,478 were renter occupied. Similar low vacancy rates were seen for the City of Sheridan and the towns of Dayton and Ranchester. According to Census 2000 data, rental vacancy rates were 4.7 percent for the entire county, 4.5 percent for the City of Sheridan, 7.9 percent for the town of Dayton and 1.3 percent for the town of Ranchester. Very few residential building permits were issued for Sheridan County in the 1980s, but reached a high of 172 in 1996, then declined to 90 in 1999 (Wyoming Department of Administration and Information, Division of Economic Analysis July 2001)

Sheridan County had the fourth highest cost of living index in the state as of January 2001. It ranked highest of all the counties for food, third in housing and transportation (tied with four other counties), fourth in apparel and medical, and fifth in

recreation/personal care. Housing rental rates are rising much faster than the general consumer price index. Comparing the fourth quarters of 2000 and 1999, rental rates in Sheridan County had risen 8.3 percent for apartments, 7.1 percent for mobile home lots, 9.8 percent for houses, and 17.7 percent for mobile homes. This compares with a statewide overall inflation rate of 3.2 percent (Wyoming Department of Administration and Information March 2001).

According to the Department of Employment, the population in Wyoming's northeast area grew by 12.7 percent over the past decade, but housing stock only increased by 6.2 percent (Sheridan County Roundup August 2001).

#### 3.4.18.5 Local Government Facilities and Services

Most of the tax revenues in Sheridan County come from sales and use taxes and property taxes. Mineral production provides a minor source of revenues to local governments in Sheridan County. This is a change from the 1980s, before the Big Horn Coal Mine began to close down their operations and prepare for final reclamation. Production at Big Horn Coal Mine peaked at 4 mmpty in 1981 and declined steadily after a long-term contract with Chicago's Commonwealth Edison expired in 1988. During the peak production years Big Horn Coal accounted for nearly half the county's assessed valuation (Sheridan Press, March 12, 1994). In 2000, the mine produced only 38,400 tons and employed just 11 persons (Wyoming State Inspector of Mines 2001). The mine is now being reclaimed. State-wide, the assessed valuation for minerals was 51.6 percent of the total assessed valuation in fiscal year 2000 (Wyoming Taxpayers Association 2001). In Sheridan County, the total assessed valuation for 2000 was $145 million, up 8.6 percent from the prior year. Only $1.8 million of that was from mineral production. Total 2000 property taxes levied in Sheridan County were $10.1 million, up 7.2 percent from the prior year. Minerals are taxed at 100 percent of assessed valuation, while industrial property is taxed at 11.5 percent of assessed valuation and all other real and personal property at 9.5 percent.

Most of Wyoming's property taxes fund education (about 69.7 percent), with the remainder going to county governments (20.6 percent), special districts (4.0 percent), community college (3.8 percent), and municipalities (1.9 percent). Because minerals are taxed at full valuation, counties vary in property tax wealth. For example, in Niobrara county one mill raises $30,862 in taxes, while in mineral-rich Campbell County one mill raises $1.6 million (Wyoming Taxpayers Association 2001).

In Sheridan county there are 17 jurisdictions levying property taxes. These include 5 municipalities, 3 school districts, 2 recreation districts, 1 community college, 1 weed and pest control district and 5 fire districts.

Public facilities in Sheridan County are meeting current needs. School enrollment is declining due to the aging population. Memorial Hospital of Sheridan County, owned by the county, recently underwent a major expansion, funded in large part by AML funds.

3.4.18.6 Social Conditions

Sheridan County is experiencing a relatively stable social setting. Coal mining is no longer a major force in the local economy as it once was, but employees of the Spring Creek and Decker mines in Montana reside primarily in Sheridan County. There is interest in CBM development in the County, but this development has been delayed due to difficulties in disposing of the produced water. WDEQ is currently not issuing permits to discharge CBM water into tributaries of the Tongue River (Maggie Davison, June 15, 2001).

Most residents have lived in the area for a number of years, social ties are well established, and residents take great pride in their communities. Many of the people place a high priority on maintaining informal lifestyles and small town traditions, and there are some concerns that the area could be adversely affected by more than a modest growth in population. At the same time, there is substantial interest in enhancing the economic opportunities available in the area and a desire to accommodate reasonable levels of growth and development.

Wyoming's economy reached the bottom of an energy bust in 1987 and started to recover. That recovery began to slow in 1996, due to low prices for coal, oil and gas. In 1999, for the first time since 1977, minerals comprised less than half the State's total assessed valuation. Since then energy and fuel prices have risen, and this trend is expected to continue. The forecast is for slow growth through 2009; Wyoming's population is projected to increase at 1.0 percent per year. Non-agricultural employment is projected to increase by 10.2 percent by 2009, increasing 1.1 percent per year. Mining employment is projected to grow by 7.5 percent by 2009, mostly within the oil and gas sector. In 2000 there were 17,160 jobs in the mining sector, of which 9,300 were in the oil and gas sector (Wyoming Department of Administration and Information, April 2001).

3.4.18.7 Environmental Justice

Environmental Justice issues are concerned with actions that unequally impact a given segment of society either as a result of physical location, perception, design, noise, or other factors. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the *Federal Register* (59 FR 7629). The Executive Order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on

minority populations and low-income populations (defined as those living below the poverty level). The Executive Order makes it clear that its provisions apply fully to Native American populations and Native American tribes, specifically to effects on tribal lands, treaty rights, trust responsibilities, and the health and environment of Native American communities.

Communities within Sheridan County, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of a new coal mine within the area. Communities potentially impacted by the presence or absence of a coal mine have been identified in this section of the EIS. Environmental Justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of Environmental Justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning Environmental Justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with the consultation and coordination described in Section 1.5 of this document. This EIS and contributing socioeconomic analysis provide a consideration of impacts with regard to disproportionately adverse impacts on minority and/or low-income groups, including Native Americans.

### 3.4.19 Hazardous and Solid Waste

Potential sources of hazardous or solid waste on P&M's proposed Ash Creek Mine would include spilling, leaking, or dumping of hazardous substances, petroleum products, and/or solid waste associated with mineral, coal, oil and/or gas exploration and development or agricultural or livestock activities. No such hazardous or solid wastes are known to be present on the tract at this time. All wastes produced by the reclaimed PSO No. 1/Ash Creek Mine were disposed of according to WDEQ-approved disposal plans. Wastes produced by the proposed Ash Creek Mine would also be handled according to the procedures described in Chapter 2.

# 4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences that may result from implementing the Proposed Action and Alternative 1. The effect or impact a consequence will have on the quality of the human environment is also discussed. Evaluation of the significance of an impact would depend on an individual's (or a group's) preferred use of that area.

Impacts can range from beneficial to adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation), or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR[1] 1508.27) and the professional judgement of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

Sections 4.1, 4.2, and 4.3 of this chapter discuss the direct and indirect impacts of acquiring the lands offered by P&M under the Proposed Action. Section 4.4 analyzes the direct and indirect impacts associated with mining the PSO Tract under the Proposed Action. Section 4.5 presents the probable environmental consequences of the No-Action Alternative (Alternative 1). Under this alternative, the exchange would not be completed and the coal within the PSO Tract would not be mined as proposed. Section 4.6 discusses mitigation and monitoring that may be required in addition to what is required by federal and/or state law (and is therefore part of the Proposed Action). Section 4.7 summarizes the residual effects of the Proposed Action. Section 4.8 discusses the cumulative impacts that would occur if the exchange is completed when added to other past, present, and reasonably foreseeable future actions. The cumulative impact analysis includes a discussion of all mining and mining-related activities (such as coal transportation), CBM development, and other projects that are in progress, or are proposed in the area of the PSO Tract that do or would occur independently of the exchange proposal. Section 4.9 analyzes the relationship between local short-term uses of man*s environment and the maintenance and enhancement of long-term productivity. Section 4.10 presents the irreversible and irretrievable commitments of resources that would occur with implementation of the Proposed Action.

[1] Refer to page viii for a list of abbreviations and acronyms used in this document.

## 4.1 Impacts of Acquiring the Bridger Lands

Under the Proposed Action, the Bridger tracts shown in Figure 1-2 would become public lands. These lands are currently private in-holdings which are surrounded by public lands. If the exchange is completed, the tracts or portions of tracts that are within the BTNF would be administered by the USFS, and the tracts or portions of tracts lying outside the BTNF would be administered by the BLM Pinedale Field Office.

The Bridger tracts inside the BTNF include most of the remaining parcels of private land within the USFS Kemmerer Ranger District. As indicated in Chapter 1, acquisition of these lands is a high priority for the USFS. If the exchange is completed and the tracts inside the BTNF become Forest Service lands, the USFS anticipates no changes to the current management of the area. Public access to these areas would be ensured. The tracts would be incorporated into the surrounding Management Areas which include Management Area 12, La Barge Creek, and Management Area 13, Hams Fork. The Desired Future Condition (DFC) for the lands surrounding these parcels is DFC 10 which is described in the Forest Plan for the BTNF as "simultaneous development of resources, opportunities for human experiences, and support for big game and a wide variety of wildlife species." Under this designation, the area would be managed to allow for some resource development and roads while having no adverse and some beneficial effects on wildlife.

The Bridger tracts outside of the BTNF would be administered by the BLM Pinedale Field Office. These lands are not specifically identified in the Pinedale Resource Management Plan for acquisition, but they lie within a retention area. BLM would manage the acquired lands as they manage the surrounding public lands.

The Bridger tracts that would be administered by BLM are unfenced from the South La Barge Common grazing allotment. Currently, the BLM credits the private grazing permittee for inclusion of these private AUMs into the grazing permit. If the exchange is completed, the grazing permittee would lose the private grazing agreement which includes 118 AUMs. BLM would divide these AUMs up among the 8 permittees in the La Barge Common grazing allotment.

## 4.2 Impacts of Acquiring the JO Ranch Lands

Under the Proposed Action, the JO Ranch lands shown in Figure 1-3 would become public lands. These lands are currently private in-holdings which are surrounded by public lands. If the exchange is completed, these lands would be administered by the BLM Rawlins Field Office.

These lands are currently used for livestock grazing and wildlife habitat,

consistent with the typical uses of the surrounding BLM lands. The existing Great Divide Resource Management Plan does not address acquisition of lands, but it identifies exchanges as the preferred method of disposal and acquisition of lands. Under the Proposed Action, the BLM Rawlins Field Office would change the Great Divide Resource Management Plan, with public input, to address land acquisition and BLM management of these lands.

If the exchange is completed, BLM would acquire the riparian habitat along Cow Creek, sand hills habitat in the northern part of the lands proposed for exchange, and the JO Ranch buildings. The portion of Cow Creek included in the exchange, the adjacent riparian habitat, and the sand hills habitat are important in terms of the plant and animal life they support and they are not common in terms of total acreage in this area. This portion of Cow Creek could be important to non-game sensitive fish species like roundtail chubs, flannelmouth suckers, and bluehead suckers. The sand hills habitat area could be added to the existing Sand Hills Area of Critical Environmental Concern or ACEC. The objectives for management of the Sand Hills ACEC are to protect the unique vegetation complex, maintain wildlife values, minimize soil erosion, and promote recreational opportunities. The JO Ranch buildings are historically significant and are eligible for inclusion as a National Historic site.

The grazing AUMs on the private lands are currently used to calculate the carrying capacity for the BLM grazing allotments. Therefore, the private lands are managed as part of the allotment. This management would not change if the JO Ranch lands are acquired.

## 4.3 Impacts of Acquiring the Welch Lands

Under the Proposed Action, the Welch lands shown in Figure 1-4 would become public lands. Unlike the other properties being offered for exchange by P&M, the Welch lands are not in-holdings within other federal lands but are surrounded by private lands. If the exchange is completed, these lands would be administered by the BLM Buffalo Field Office.

Section 206 of FLPMA, which deals with exchanges, and Section 209 of FLPMA, which deals with the reservation and conveyance of minerals, have both been incorporated into the existing approved resource management plan for the Buffalo Field Office. Under the Proposed Action, the BLM Buffalo Field Office would develop an amendment to their land use plan, with public input, that would address BLM management of the Welch lands if the exchange is completed.

The Welch lands are a unique area in northern Sheridan County containing highly productive riparian haylands, upland hills, scoria outcrops, and river and riparian habitat in pristine condition. Since it includes about 1.5

miles of the Tongue River, the property has high potential for public recreation including fishing, big game and bird hunting, non-motorized boating, hiking, horseback riding, mountain biking and picnicking. The location of the Welch lands adjacent to the Tongue River and Thunderchild Rehabilitation Center may offer some recreational and management opportunities.

If the exchange is completed, BLM does not plan to change the existing management of the Welch lands, which has protected the natural resources and pristine conditions that presently exist. Existing uses on the Welch lands and surrounding area include livestock grazing and oil and gas development. These uses would continue under management to protect the existing conditions. Land uses which do not currently exist on the lands, such as motorized recreation, would be evaluated with public input when BLM develops an amendment to the existing land use plan to address management of the Welch lands.

## 4.4 Impacts of Exchanging the Coal in the PSO Tract

If P&M acquires the federal coal beneath the PSO Tract under the Proposed Action, it is assumed that the PSO Tract would be developed into a new surface mine. For this analysis, it is also assumed that all the federal coal within the PSO Tract would be exchanged and be a part of the proposed Ash Creek mine plan (although the actual amount of coal to be exchanged will depend upon the appraisal process). The boundaries of the tract would be consistent with the tract configurations proposed by P&M in the exchange proposal. In order to recover all of the mineable coal included in the PSO Tract and the adjacent private coal P&M proposes to mine, the area that would have to be permitted would be the tract as proposed plus the adjacent privately owned coal plus an adjacent strip of land that would be used for highwall reduction after mining and such mine-related activities as construction of diversions, flood- and sediment-control structures, roads, and stockpiles. Table 4-1 shows the area of the PSO Tract that would be mined and the disturbance area. The environmental consequences of implementing the Proposed Action or Alternative 3 would be the same. The coal would not be mined under Alternatives 1 and 2.

Surface mining and reclamation have been ongoing in the PRB for over two decades. During this time, effective mining and reclamation technologies have been developed and continue to be refined. Mining and reclamation operations are regulated under SMCRA and Wyoming statutes. WDEQ technically reviews all mine permit application packages to ensure that the mining and reclamation plans comply with all state permitting requirements and that the proposed coal mining operations comply with the performance standards of the DOI-approved Wyoming program. There are a number of federal and state permit approvals that are required in order to conduct surface mining operations (Appendix A). The

Table 4-1. Comparison of the Proposed Ash Creek Mine Disturbance and Mined Areas.

| | No Action Alternative | Proposed Action |
|---|---|---|
| Total Area of Federal Coal Exchanged (Acres) | none | 2,045 |
| Estimated Area of Federal Coal Mined (Acres) | none | 1,079 |
| Estimated Total Disturbance Area (Acres)[1] | none | 2,595 |

Notes: [1] Total Disturbance Area = area to be mined (PSO Tract and adjacent privately owned coal) + area disturbed for mine facilities, access roads, haul roads, railroad facilities, stockpiles, etc.

regulations are designed to ensure that surface coal mining impacts are mitigated. The impact assessment that follows considers all measures required by federal and state regulatory authorities as part of the Proposed Action.

### 4.4.1 Topography and Physiography

Surface coal mining would permanently alter the topography of the PSO Tract. Topsoil would be removed from the land and stockpiled or placed directly on recontoured areas. Overburden would be blasted and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography on the PSO Tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. If necessary, West Branch, Little Youngs Creek and Youngs Creek would be diverted into temporary channels or blocked to prevent flooding of the pits.

Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. The original topography of the PSO Tract is somewhat rugged. As a result, the expected post-mining topography would be more homogenous and subdued, but would blend with the undisturbed surroundings. Following reclamation, the average post-mining topography would be slightly lower in elevation than the pre-mining topography due to removal of the coal. (The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted, excavated and backfilled.) The land surface would be restored to the approximate original contour or to a configuration approved by WDEQ/LQD during the mine permitting process.

Direct adverse impacts resulting from topographic moderation include a reduction in microhabitats (e.g., cutbank slopes and bedrock bluffs) for some wildlife species and a reduction in habitat diversity, particularly a reduction in slope-dependent shrub communities and associated habitat. A potential

indirect impact may be a long-term reduction in big game carrying capacity. A direct beneficial impact of the lower and flatter terrain would be reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur as a result of higher near-surface bulk density of the reclaimed soils (Section 4.4.3). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater.

The approximate original drainage pattern would be restored, and stock ponds would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the post-mining topography would adequately support anticipated land use of the PSO Tract. These measures are required by state regulations and are therefore considered part of the Proposed Action. Under the Proposed Action, the area that would be permanently topographically changed, as shown in Table 4-1, is 2,595 acres.

4.4.2 Geology and Minerals

P&M estimates that the proposed mining area would encompass approximately 1,720 acres. Thicknesses of the mineable coal seams vary across the project area, as described in Section 3.4.3.

The geology from the base of the Dietz 3 coal seam to the land surface would be subject to permanent change on the PSO Tract under the Proposed Action. The resulting subsurface physical characteristics of these lands would be substantially altered by mining. The replaced overburden and interburden (backfill) would be a relatively homogeneous (compared to the pre-mining layers of shale, siltstone, and sandstone overburden and interburden) and partly recompacted mixture. In the southern portion of the mine area where only the Dietz 3 seam would be mined, the replaced backfill would average approximately 140 ft thick, and in the northern part of the mine area where both the Dietz 3 and Dietz 1 seams would be mined, the replaced backfill thickness would average approximately 260 ft.

Drilling and sampling programs are conducted by all mine operators to identify overburden material that may be unsuitable for reclamation (i.e., material that is not suitable for use in reestablishing vegetation or that may affect groundwater quality due to high concentrations of certain constituents such as selenium or adverse pH levels). As part of the mine permitting process, each mine operator is required to develop a management plan to ensure that this unsuitable material is not placed in areas where it may affect groundwater quality or revegetation success. Each mine operator must also develop backfill monitoring plans as part of the mine permitting process to evaluate the quality of the replaced overburden. These plans would be developed for the proposed Ash Creek Mine if the exchange is completed.

During mining, other minerals present on the tract could not be developed. However, some of these minerals could be developed after mining. Several parcels are currently leased for oil and gas, although no conventional oil and gas wells are present on the PSO Tract. Several unsuccessful oil and gas exploration wells have been drilled on the tract, and oil and gas production continues to occur west of the tract in the Ash Creek and Ash Creek South Fields. The reservoirs from which the Ash Creek and Ash Creek South Fields produce would not be disturbed by mining; therefore, the potential exists for further conventional oil and gas exploration and production from any subcoal oil and gas reservoirs on the PSO Tract following mining.

As discussed in Sections 3.4.3 and 3.4.11, CBM development has rapidly occurred within and adjacent to the PSO Tract since 1999, and there are three potential coal seams (Dietz 3, Monarch, and Carney) that would be expected to produce CBM in the area. Only the Dietz 3 seam would be directly affected by mining. CBM resources that are not recovered from the Dietz 3 prior to mining would be irretrievably lost when the coal is removed. CBM in the Monarch and Carney seams not recovered prior to mining could be recovered after mining. However those resources could potentially be drained from underneath the PSO Tract by wells completed in the Monarch and Carney seams on lands adjacent to the tract.

Currently, there are 147 CBM wells completed or permitted to be drilled within T.57N., R.84W., and there are 67 CBM wells within three miles of the PSO Tract in Montana. Nine CBM well locations (five existing and four permitted) are within the boundary of the federal coal being considered for exchange. The development of CBM in Sheridan County (Wyoming) and Big Horn County (Montana) has been affected by uncertainty due to difficulties in disposal of the produced water.

Groundwater from the Fort Union Formation coal seams in the northern and western parts of the PRB has a relatively high SAR which has caused concern about issuing permits to discharge CBM water into tributaries of the Tongue River. In the BLM's preferred alternative in the PRB Oil and Gas Project Draft EIS (Alternative 1), it is assumed that water in the Upper Tongue River sub-watershed would be handled by amending through passive methods before discharge or by infiltration or containment impoundments.

None of the existing CBM wells in the Ash Creek/Youngs Creek area in Wyoming are in production at this time. Those CBM wells just north of the state line in Montana that are currently producing are exempt from the discharge moratorium by a grandfather clause.

For this analysis, it is assumed that the CBM wells would produce until mining activity approaches each well. This arrangement would be dependent on cooperation between

the federal oil and gas lessees, the owners of the private oil and gas rights (Figure 3-10), and P&M. Average well life estimated by most of the producers in the PRB is expected to be 10 to 12 years (DeBruin, et al. 2001), and the highest production rates typically occur during the first half of a well's life. Therefore, BLM estimates that a large portion of the CBM reserves could be recovered prior to initiation of mining activity on the PSO Tract under the Proposed Action, if the water discharge issues are resolved and the wells can begin producing.

CBM reserves not recovered from the Dietz 3 prior to mining would be vented to the atmosphere. CBM resources in the deeper coals may be drained from beneath the PSO Tract if they are not recovered prior to mining. Any facilities and equipment associated with CBM production and development on the PSO Tract would have to be removed prior to mining.

### 4.4.3 Soils

Disturbance related to coal mining would directly affect 2,595 acres of soil resources on and adjacent to the PSO Tract under the Proposed Action. The reclaimed soils would have different physical, biological, and chemical properties than the pre-mining soils. They would be more uniform in type, thickness, and texture. Average topsoil thickness would be 24 to 36 inches across the entire reclaimed surface. Soil chemistry and soil nutrient distribution would be more uniform, and average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on the reclaimed land. The replaced topsoil would support a stable and productive vegetation community adequate in quality and quantity to support the planned post-mining land uses (wildlife habitat and rangeland).

Specific impacts to soil resources would include an increase in the near-surface bulk density of the reclaimed soil resources. As a result, the average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. Topographic moderation following reclamation would potentially decrease runoff, which would tend to offset this potential increase in runoff due to decreased soil infiltration capacity. The change in soil infiltration rates would not be permanent because revegetation and natural weathering action would form new soil structure in the reclaimed soils, and infiltration rates would gradually return to pre-mining levels.

Direct biological impacts to soil resources would include a short-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil resources that are stockpiled before placement. Topsoil would be removed and stockpiled or direct placed on regraded surfaces. Once the mining operation is in a steady-state production condition, topsoil would

be directly placed to eliminate the need to rehandle.

Sediment control structures would be built to trap eroded soil, revegetation would reduce wind erosion, and soil or overburden materials containing potentially harmful chemical constituents (such as selenium) would be specially handled. These measures are required by state regulations and are therefore considered part of the Proposed Action.

### 4.4.4 Air Quality

#### Regulatory Background

Ambient air quality and the emission of air pollutants are regulated under both federal and state laws and regulations. Regulations potentially applicable to the Proposed Action include the following: NAAQS; WAQSR; PSD; NSPS; Federal Operating Permit Program (Title V); and State of Wyoming Standards for BACT.

The Federal CAA, and the subsequent CAAA of 1990, require the U.S. EPA to identify NAAQS to protect public health and welfare. The CAA and the CAAA established NAAQS for six pollutants, known as "criteria" pollutants because the ambient standards set for these pollutants satisfy "criteria" specified in the CAA. A list of the criteria pollutants regulated by the CAA, and the currently applicable NAAQS set by the EPA for each, is presented in Table 4-2.

Pursuant to the CAA, the EPA has developed classifications for distinct geographic regions known as air basins and for major metropolitan statistical areas (MSAs). Under these classifications, for each federal criteria pollutant, each air basin (or portion of a basin or MSA) is classified as in "attainment" if the area has "attained" compliance with (that is, not exceeded) the adopted NAAQS for that pollutant, or is classified as "non-attainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant. Areas for which sufficient ambient monitoring data are not available are designated as "unclassified" for those particular pollutants. States designate areas within their borders as being in "attainment" or "non-attainment" with the NAAQS. Since the PSO Tract is near the border of Wyoming and Montana, the attainment status of nearby areas in both states is considered. The proposed Ash Creek Mine is in an area designated an attainment area for all pollutants. However, the town of Sheridan, Wyoming, located about 12 miles south of the project area, is a non-attainment area for $PM_{10}$. Also, the town of Lame Deer, Montana, located about 50 miles northeast, is a non-attainment area for $PM_{10}$. The towns of Laurel and Billings, Montana, non-attainment areas for $SO_2$, are located about 90 miles northwest of the project area.

Under requirements of the CAA, the EPA has established PSD rules, the purpose of which is to prevent deterioration of air quality in areas that are in attainment with the

Table 4-2. Federal and State Ambient Air Quality Standards for Criteria Pollutants.

| | | Wyoming Standards | Federal Standards | |
|---|---|---|---|---|
| **Criteria Pollutant** | **Averaging Period** | **Concentration[a]** | **Primary Concentration[a]** | **Secondary Concentration[b]** |
| Ozone ($O_3$) | 1-Hour | ---- | 120 ppbv (235 μg/m$^3$) | Same as Primary Standards |
| | 8-Hour[b] | 80 ppbv[c] | 80 ppbv (157 μg/m$^3$) | ---- |
| Carbon Monoxide (CO) | 8-Hour[d] | 9 ppmv (10 mg/m$^3$) | 9 ppmv (10 mg/m$^3$) | ---- |
| | 1-Hour[e] | 35 ppmv (40 mg/m$^3$) | 35 ppmv (40 mg/m$^3$) | ---- |
| Oxides of Nitrogen ($NO_x$) as Nitrogen Dioxide ($NO_2$) | Annual | 100 μg/m$^3$ (50 ppbv) | 100 μg/m$^3$ (53 ppbv) | Same as Primary Standards |
| Sulfur Dioxide ($SO_2$) | Annual | 60 μg/m$^3$ (20 ppbv) | 80 μg/m$^3$ (30 ppbv) | ---- |
| | 24-Hour[d] | 260 μg/m$^3$ (100 ppbv) | 365 μg/m$^3$ (140 ppbv) | ---- |
| | 3-Hour[d] | 1,300 μg/m$^3$ (500 ppbv) | ---- | 1,300 μg/m$^3$ (500 ppbv) |
| Particulate Matter #10 Microns in Aerodynamic Diameter ($PM_{10}$) | 24-Hour[d] | 150 μg/m$^3$ | 150 μg/m$^3$ | Same as Primary Standards |
| | 24-Hour (Based on the 99$^{th}$ Percentile Averaged over Three Years) | ---- | 150 μg/m$^3$ | ---- |
| | Annual Arithmetic Mean | 50 μg/m$^3$ | 50 μg/m$^3$ | Same as Primary Standards |
| Particulate Matter #2.5 Microns in Aerodynamic Diameter ($PM_{2.5}$) | 24-Hour (Based on the 98$^{th}$ Percentile Averaged over Three Years) | ---- | 65 μg/m$^3$ | ---- |
| | Annual Arithmetic Mean Averaged over Three Years | ---- | 15 μg/m$^3$ | ---- |
| Lead (Pb) | Calendar Quarter | 1.5 μg/m$^3$ | 1.5 μg/m$^3$ | Same as Primary Standards |
| Hydrogen Sulfide | ½ Hour | Primary 70 μg/m$^3$[e] | ---- | ---- |
| | ½ Hour | Secondary 40 μg/m$^3$[f] | ---- | ---- |
| Suspended Sulfates | Annual | 250 μg/m$^3$ | ---- | ---- |
| | 30 Day | 500 μg/m$^3$ | ---- | ---- |
| Fluorides in Ambient Air | 12 Hours | 3 μg/m$^3$ | ---- | ---- |
| | 24 Hours | 1.8 μg/m$^3$ | ---- | ---- |
| | 7 Days | 0.5 μg/m$^3$ | ---- | ---- |
| | 30 Days | 0.4 μg/m$^3$ | ---- | ---- |

a Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm mercury. Measurements of air quality are corrected to a reference temperature of 25°C and a reference pressure of 760 mm mercury (1,013.2 millibar); ppmv and ppbv in this table refer to parts per million by volume and parts per billion by volume, respectively, or micro-moles of pollutant per mole of gas. μg/m$^3$ = micrograms per cubic meter.

b The 8-hour ozone standard would be implemented once an area achieves attainment for the 1-hour standard.

c The 8-hour ozone standard is met when the average of the annual fourth highest daily maximum 8-hour average ozone concentration is less than or equal to .008 ppm (80 ppbv).

d A violation occurs on the second exceedance during a calendar year.

e Not to be exceeded more than two (2) times per year.

f Not to be exceeded more than two (2) times in five (5) consecutive days.

national AAQS. Increases in ambient concentrations of $NO_2$, $SO_2$, and $PM_{10}$ are limited to modest increments in Class II areas (most of the country), and to very small increments in Class I areas (national parks and other designated pristine areas).

In addition to the designations relative to attainment of the NAAQS, the CAA requires the EPA to place each airshed within the United States into one of three PSD area classifications. PSD Class I is the most restrictive air quality category. It was created by Congress to prevent further deterioration of air quality in National Parks and Wilderness Areas of a given size which were in existence prior to 1977 or those additional areas which have since been designated Class I under federal regulations (40 CFR 52.21). All remaining areas outside of the designated Class I boundaries were designated Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow air quality to degrade to the NAAQS, have been designated. The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources. These sensitive Class II areas include the Northern Cheyenne Indian Reservation, Cloud Peak Wilderness Area and Devil's Tower National Monument, which are approximately 25, 36 and 93 miles distant, respectively. The closest designated Class I area to the PSO Tract is the North Absaroka Wilderness, located about 130 miles to the west of the site. The next closest Class I area is Wind Cave National park in South Dakota, located about 195 miles east southeast of the site.

Federal PSD regulations limit the maximum allowable increase in ambient particulate matter in a Class I airshed resulting from a major stationary source or major modification to 4 $\mu g/m^3$ (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities which emit, or have the PTE, 100 tpy or more of $PM_{10}$ or other criteria air pollutants, or any facility which emits, or has the PTE, 250 tpy of more of $PM_{10}$ or other criteria air pollutants, is considered a major stationary source. However, fugitive emissions are not counted against the PSD threshold unless the source is so designated by federal rule (40 CFR 52.2).

The NSPS were established by the CAA. The standards, which are for new or modified stationary sources, require the sources to achieve the best demonstrated emissions control technology. The NSPS apply to specific types of processes, which in the case of the Proposed Action include certain activities at the coal preparation plant. The requirements applicable to these existing units are found in 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Plants), and WAQSR Chapter 5, Section 2 (b) Subpart Y.

As part of the CAA and its subsequent amendments, a facility-wide permitting program was established for larger sources of pollution. This program, known as the Federal Operating Permit, or Title V program, requires that these "major sources" of air pollutants submit a Title V permit application. To be classified as a "major source", a facility must have a PTE of greater than 100 tpy of any regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy or more of any combination of HAPs, from applicable sources. Fugitive emissions are only counted towards these thresholds for certain categories of facilities. In the case of the Proposed Action, fugitive emissions from mining activities would be exempt, but fugitive emissions directly associated with the preparation plant (e.g., fugitive truck dump emissions) would be considered in the threshold determination.

As discussed in Section 3.4.5, there is public concern over the releases of $NO_x$ from overburden blasting, which can form a low-lying, gaseous orange cloud that can be transported by wind. Exposure to $NO_x$ can cause adverse health effects. Appendix F provides information about nitrogen dioxide ($NO_2$) and its potential health effects. In the Powder River basin, individuals have complained of health effects after exposure to visible clouds. EPA has expressed concerns that $NO_x$ levels in some blasting clouds may be sufficiently high at times to cause human health effects. In the summer of 1999 a collaborative group of PRB mines, under the Air Quality Subcommittee of the WMA, collected background air quality data and developed a monitoring program to collect information on the contents of post-blast clouds. A report prepared by the subcommittee and titled *Powder River Basin Short-term Exposure to $NO_2$ Study* provides a summary of that data, and a brief discussion of its contents is included in Section 4.8.4.

As a result of these incidents, WDEQ has directed some mines to take steps designed to mitigate the effects of $NO_2$ emissions occurring from overburden blasting. The steps that may be required include: public notifications (in the form of warning signs along public roadways for example); temporary closure of public roadways near a mine during and after a blast; establishment of safe set-back distances from blasting area; prohibiting blasting when wind direction is toward a neighbor; prohibiting blasting during temperature inversions; establishment of monitoring plans; estimation of $NO_2$ concentrations; and development of blasting procedures that would protect public safety and health.

<u>Specific Regulatory Applicability – Proposed Action</u>

Emission inventories (Table 4-3) were developed for each year for the Proposed Action, based on the Life of Mine operating parameters shown in Table 4-4. For purposes of determining PTE for PSD and Title V applicability purposes, only point source emissions and fugitive truck

Table 4-3. Annual Emissions Summary for the Proposed Ash Creek Mine.

| Year | Source | $PM_{10}$ (tpy) | $NO_x$ (tpy) | CO (tpy) | VOC (tpy) |
|---|---|---|---|---|---|
| 0 | Fugitive | 61.4 | 0 | 0 | 0 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **89.4** | **0** | **0** | **0** |
| 1 | Fugitive | 79.5 | 59.03 | 18.53 | 3.2 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **107.5** | **59.03** | **18.53** | **3.2** |
| 2 | Fugitive | 88.4 | 121.17 | 40.25 | 6.14 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **116.4** | **121.17** | **40.25** | **6.14** |
| 3 | Fugitive | 127.2 | 226.63 | 76.2 | 10.63 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **155.2** | **226.63** | **76.2** | **10.63** |
| 4 | Fugitive | 174.2 | 341.36 | 114.21 | 15.36 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **202.2** | **341.36** | **114.21** | **15.36** |
| 5 | Fugitive | 230.7 | 496.28 | 169.26 | 21.92 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **258.7** | **496.28** | **169.26** | **21.92** |
| 6 | Fugitive | 233.1 | 517.3 | 177.95 | 22.84 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **261.1** | **517.3** | **177.95** | **22.84** |
| 7 | Fugitive | 227 | 489.52 | 169.36 | 21.91 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **255** | **489.52** | **169.36** | **21.91** |
| 8 | Fugitive | 213.4 | 467.84 | 161.74 | 21.08 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **241.4** | **467.84** | **161.74** | **21.08** |
| 9 | Fugitive | 209.3 | 436.17 | 147.59 | 19.58 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **237.3** | **436.17** | **147.59** | **19.58** |
| 10 | Fugitive | 224.1 | 478.97 | 163.05 | 21.25 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **252.1** | **478.97** | **163.05** | **21.25** |
| 11 | Fugitive | 207.9 | 450.46 | 153.66 | 20.22 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **235.9** | **450.46** | **153.66** | **20.22** |
| 12 | Fugitive | 200.4 | 436.6 | 149.33 | 19.75 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **228.4** | **436.6** | **149.33** | **19.75** |
| 13 | Fugitive | 158.6 | 339.37 | 115.91 | 16.13 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **186.6** | **339.37** | **115.91** | **16.13** |
| 14 | Fugitive | 156.5 | 336.22 | 115.23 | 16.05 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **184.5** | **336.22** | **115.23** | **16.05** |
| 15 | Fugitive | 222.7 | 469.42 | 158.25 | 20.74 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **250.7** | **469.42** | **158.25** | **20.74** |
| 16 | Fugitive | 259.4 | 575.09 | 197.16 | 24.93 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **287.4** | **575.09** | **197.16** | **24.93** |
| 17 | Fugitive | 237 | 510.99 | 171.25 | 22.16 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **265** | **510.99** | **171.25** | **22.16** |
| 18 | Fugitive | 54 | 20.92 | 5.97 | 1.82 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **82** | **20.92** | **5.97** | **1.82** |
| 19 | Fugitive | 37.9 | 20.92 | 5.97 | 1.82 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **65.9** | **20.92** | **5.97** | **1.82** |
| 20 | Fugitive | 15.4 | 7.58 | 2.29 | 0.53 |
| | Point | 28 | 0 | 0 | 0 |
| | **Total** | **43.4** | **7.58** | **2.29** | **0.53** |

Table 4-4. Life of Mine Operating Parameters for the Proposed Ash Creek Mine.

| Year | Scraper Hours | Overburden Removal (bcy) | Coal Removed (tons) | Open Acres | Overburden Truck (miles traveled) | Coal Truck (miles traveled) | Grader Hours | Overburden Blasts | Coal Blasts | Facility Fuel Use (gallons) | ANFO (tons) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 13,918 | 0 | 0 | 460 | 0 | 0 | 1,500 | 0 | 0 | 24,363 | 0 |
| 1 | 6,208 | 3,000,000 | 1,000,000 | 665 | 7,615 | 3,344 | 2,199 | 150 | 50 | 355,862 | 1,000 |
| 2 | 3,264 | 5,400,000 | 2,500,000 | 646 | 34,794 | 7,176 | 2,880 | 150 | 50 | 732,475 | 1,975 |
| 3 | 3,028 | 11,400,000 | 5,000,000 | 732 | 65,663 | 14,500 | 4,365 | 150 | 50 | 1,344,013 | 4,100 |
| 4 | 3,920 | 19,900,000 | 7,000,000 | 767 | 95,195 | 22,372 | 6,200 | 150 | 50 | 1,991,311 | 6,725 |
| 5 | 6,384 | 27,700,000 | 10,000,000 | 840 | 148,733 | 45,573 | 8,086 | 150 | 50 | 2,914,655 | 9,425 |
| 6 | 4,023 | 28,100,000 | 10,000,000 | 856 | 178,313 | 46,165 | 8,156 | 150 | 50 | 3,055,750 | 9,525 |
| 7 | 5,125 | 24,600,000 | 10,000,000 | 936 | 172,915 | 52,675 | 7,545 | 150 | 50 | 2,912,784 | 8,650 |
| 8 | 3,306 | 22,800,000 | 10,000,000 | 908 | 160,262 | 56,226 | 7,230 | 150 | 50 | 2,787,540 | 8,200 |
| 9 | 3,462 | 23,300,000 | 10,000,000 | 884 | 104,635 | 65,104 | 7,318 | 150 | 50 | 2,558,853 | 8,325 |
| 10 | 5,028 | 26,400,000 | 10,000,000 | 824 | 118,557 | 73,982 | 7,859 | 150 | 50 | 2,812,649 | 9,100 |
| 11 | 3,286 | 23,400,000 | 10,000,000 | 815 | 105,084 | 82,268 | 7,335 | 150 | 50 | 2,657,281 | 8,350 |
| 12 | 3,009 | 21,700,000 | 10,000,000 | 808 | 97,450 | 89,962 | 7,038 | 150 | 50 | 2,585,273 | 7,925 |
| 13 | 2,823 | 12,900,000 | 10,000,000 | 794 | 57,931 | 96,473 | 5,501 | 150 | 50 | 2,034,382 | 5,725 |
| 14 | 2,526 | 12,200,000 | 10,000,000 | 799 | 54,788 | 102,983 | 5,378 | 150 | 50 | 2,022,602 | 5,550 |
| 15 | 4,196 | 27,100,000 | 10,000,000 | 852 | 126,992 | 45,573 | 7,981 | 150 | 50 | 2,735,632 | 9,275 |
| 16 | 6,858 | 34,000,000 | 10,000,000 | 812 | 209,114 | 27,817 | 9,187 | 150 | 50 | 3,373,355 | 11,000 |
| 17 | 6,550 | 32,200,000 | 10,000,000 | 734 | 154,034 | 18,348 | 8,872 | 150 | 50 | 2,951,637 | 10,550 |
| 18 | 5,069 | 0 | 0 | 567 | 0 | 0 | 1,500 | 0 | 0 | 148,620 | 0 |
| 19 | 9,819 | 0 | 0 | 242 | 0 | 0 | 1,500 | 0 | 0 | 148,620 | 0 |
| 20 | 7,314 | 0 | 0 | 0 | 0 | 0 | 1,500 | 0 | 0 | 54,940 | 0 |

dump $PM_{10}$ emissions at the preparation plant would count towards the PTE applicability thresholds (Table 4-5). There are no applicable $NO_x$ sources that would count against the PTE, therefore the $NO_x$ PTE would be zero. The Proposed Action would not trigger PSD permitting requirements nor federal Title V operating permit requirements based on these inventories.

Any New Sources of emissions locating within the State of Wyoming must obtain state construction and operating permits unless the emissions and impacts are determined to be "insignificant" by the Administrator of the WDEQ/AQD. While the term "insignificant" is not defined for these purposes within the WAQSR, the magnitude of emissions predicted from the Proposed Action would without doubt trigger state construction and operating permit requirements based on long standing WDEQ/AQD policy with regard to surface coal mines.

The construction permitting rules of the WDEQ/AQD (Chapter 6, Section 2 of the WAQSR) provide that a permit to construct cannot be issued unless the applicant demonstrates that the facility (Proposed Action) would comply with all applicable aspects of the WAQSR, including that the facility would not cause or significantly contribute to exceedances of state or federal ambient air quality standards or increments. Moreover, the WAQSR provide that all new or modified facilities must employ BACT for the mitigation of all contaminants released to the atmosphere, regardless of the source's PTE. In the case of large surface coal mines, Section 6, Chapter 2 of the WAQSR (and long-term WDEQ/AQD policy) provides that BACT would typically include watering and chemical treatment of haul roads, silos or similar enclosures for out-of-pit coal storage, use of high efficiency baghouses or similar controls on preparation plant process sources, and other best management practices.

Table 4-5. Point Source and Applicable Fugitive Emissions for PTE Determinations.

| **Source Description** | **$PM_{10}$ (tpy) Worst-Case, Year 16** |
|---|---|
| Coal Dumping | 2.87 |
| Bin Feeder | 5.60 |
| Crusher | 11.20 |
| Silo | 5.60 |
| Loadout | 5.60 |
| **Total** | **30.87** |

Standards of Performance for Coal Preparation Plants (40 CFR 60, Certain "affected" facilities at the coal preparation plant would also be subject to a 20 percent opacity standard as provided by the Federal Subpart Y) and its equivalent state Proposed Ash Creek Mine would include coal processing and conveying equipment (including crushers, coal storage systems, and coal transfer and loading systems).

Environmental Consequences – Significance Criteria

The Proposed Action would have a significant effect on the environment if any of the following would occur:

- violation of any regulatory requirement of U.S. EPA or WDEQ/AQD;

- violation of any state or federal ambient air quality standard; or

- significant contribution to an existing or predicted air quality standard exceedance.

Air quality modeling for $PM_{10}$ and $NO_2$ was conducted for the Proposed Action to determine air quality impacts to the environment. Modeling tools used in this effort, including emission factors, estimation methods, and model selection were consistent with WDEQ/AQD policy. Air quality impacts were modeled/assessed for the "worst-case" annual period of the LOM (Year 16, Table 4-4). Annual LOM inventories were developed using WDEQ/AQD emission factors and approaches and Year 16 was selected for a detailed air quality modeling analysis.

The U.S. EPA's Industrial Source Complex (ISC3) model was used to determine model predictions of future air quality impacts. The model was run in "regulatory mode".

Model inputs included a 5-year set of hourly meteorological data collected by the National Weather Service in Sheridan, Wyoming, the emissions estimates shown in Table 4-3 (apportioned into appropriate area sources superimposed over active emitting areas of the mine) and receptor locations at which concentrations were predicted. Receptors were placed in an array encircling the active mining areas at a distance of 500 meters from the coal removal blocks.

The 500 meter distance was selected to approximate the area external to the active coal block which is needed for conduct of mining activities. For Wyoming compliance demonstrations, ambient air impacts are evaluated at the outside boundary of Lands Necessary to Conduct Mining (LNCM), assuming that these areas are fenced to preclude public access. This 500 meter distance from modeled area sources also allows all receptors to be located beyond the distance (one area source width) within which the ISC3 model may overpredict impacts because of approximations in the model area source algorithms.

Annual $PM_{10}$ concentration estimates were generated for all mine, preparation plant and truck loading sources. To determine total concentrations, a background concentration of 15 $\mu g/m^3$ (WDEQ/AQD policy) was added to the source impact prediction for comparison to applicable ambient air quality standards.

Annual $NO_x$ concentrations were generated for all mine, vehicular and blasting sources. A background of 20 $\mu g/m^3$ was added to the source impact predictions for comparison to the applicable $NO_2$ standard.

Modeling was not conducted for the short-term 24-hour $PM_{10}$ standard. The WDEQ/AQD has always held that short-term modeling of surface mining emissions was a futile exercise because of the lack of sufficiently accurate modeling tools to simulate short-term variability in mine emission rates and locations as well as short-term micro-scale variability in atmospheric dispersion conditions. Moreover, the U.S. Congress also recognized these modeling limitations in the 1990 CAAA. Section 234 of the Act prohibited the EPA from requiring states to perform short-term modeling of $PM_{10}$ from coal mines until such time as EPA could demonstrate sufficiently accurate modeling tools were available. EPA has not been able to make that demonstration to date and has reported their failure to do so to Congress.

The mitigation measures considered in the modeling of the Proposed Action satisfy the requirements for BACT per Chapter 6, Section 2 of the WAQSR. Those measures include:

- High efficiency baghouses on the crusher, conveyor transfers, storage bin and train loadout, meeting a standard of 0.01 grains per dry standard cubic foot (dscf) of exit volume

- Installation of a stilling shed to control fugitive emissions at the coal preparation plant truck dump

- Application of water and chemical surfactant to haul roads

- Watering of active work areas

- Rapid re-vegetation of reclaimed surfaces

- Reclamation plan to minimize surface disturbances subject to wind erosion

- Paving of access roads

Model results for $PM_{10}$ and $NO_2$ impacts of the Proposed Action are shown in Table 4-6 and Figures 4-1 and 4-2. Table 4-6 presents the maximum predicted annual average concentrations of $PM_{10}$ and $NO_2$ due to the Proposed Action, and maximum total concentrations after the addition of background levels due to distant and natural pollutant sources. Also shown are the applicable Wyoming and National AAQS. Operation of the proposed Ash Creek Mine during the worst-case operating year is indicated to produce

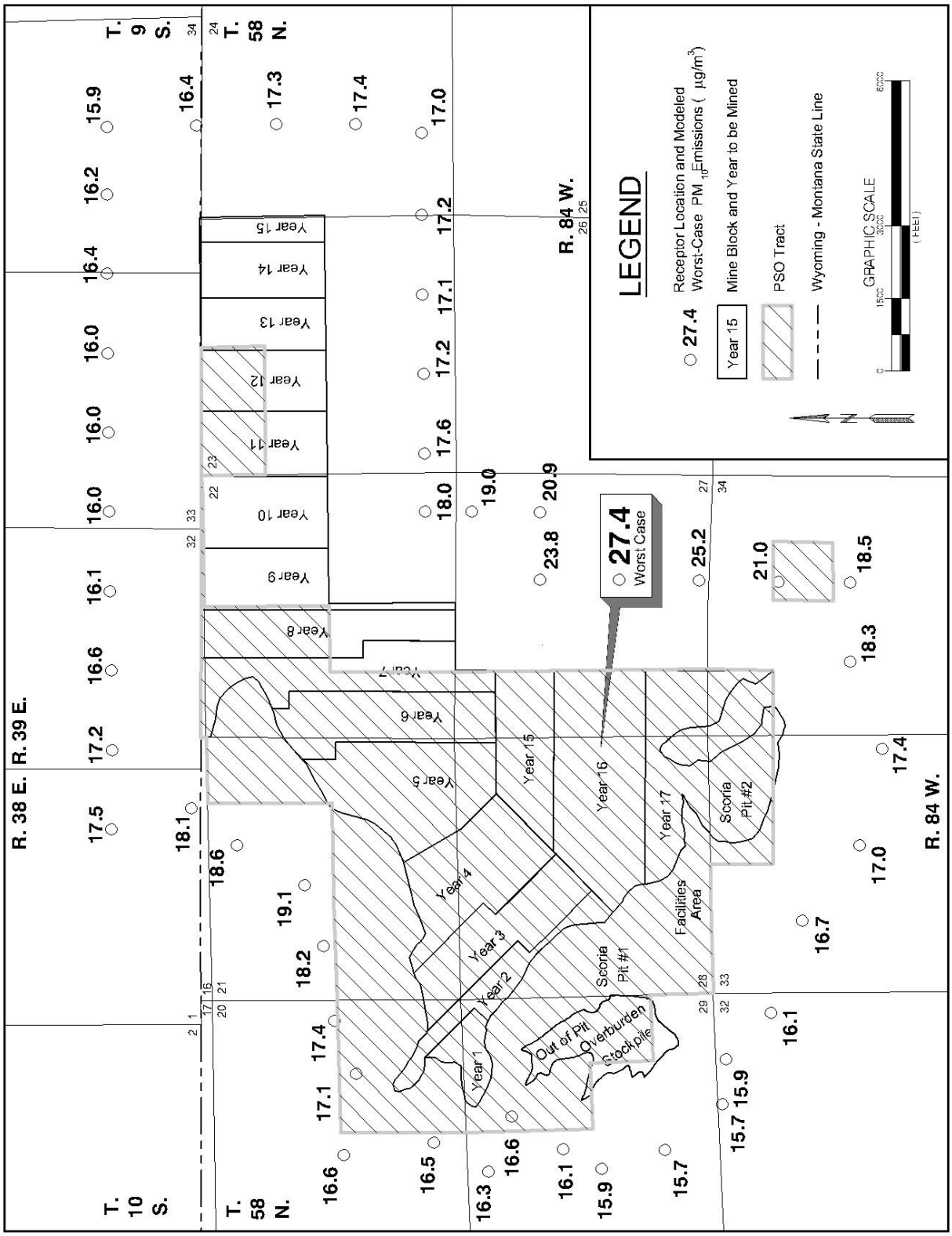



Figure 4-1. Modeled Maximum $PM_{10}$ Annual Average Concentrations ( $\mu g/m^3$ ), Including Background of 15 $\mu g/m^3$, at the Proposed Ash Creek Mine.

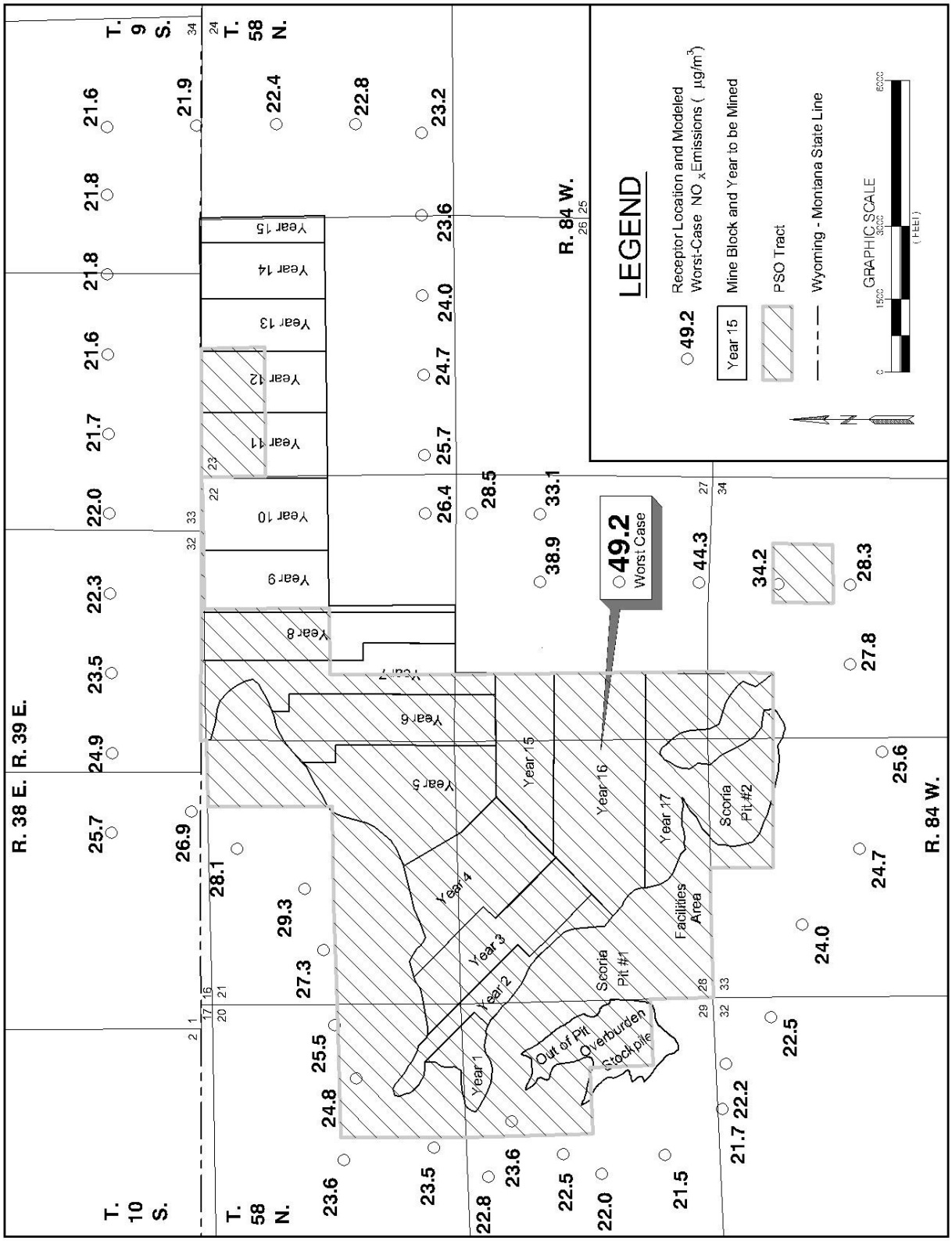



Figure 4-2. Modeled Maximum $NO_x$ Annual Average Concentrations (µg/m³), Including Background of 20 µg/m³, at the Proposed Ash Creek Mine.

Table 4-6. Comparisons of Maximum Predicted Annual Impacts to Applicable Standards.

| | **$PM_{10}$ (µg/m$^3$)** | **$NO_x$ (µg/m$^3$)** |
|---|---|---|
| Maximum Predicted Concentration | 12.4 | 29.2 |
| Background Concentration | 15.0 | 20.0 |
| Total Concentration | 27.4 | 49.2 |
| Federal AAQS | 50 | 100 |
| Wyoming AAQS | 50 | 100 |

impacts well below all ambient standards.

Figures 4-1 and 4-2 show predicted total concentrations (including background) at modeled receptor points surrounding the mine for $PM_{10}$ and $NO_2$, respectively. The plotted concentrations (in µg/m$^3$) represent predicted annual average concentrations for the modeled year with the greatest impact.

The $PM_{10}$ and $NO_2$ modeling analysis also determined maximum predicted annual concentrations at surrounding Class I and sensitive Class II areas, as well as in the town of Sheridan. The highest predicted concentrations due to the Proposed Action are 0.07 µg/m$^3$ (annual $PM_{10}$) and 0.15 µg/m$^3$ (annual $NO_2$) at the Northern Cheyenne Reservation, the Class I/Sensitive Class II area with the highest impact. These predicted concentrations are well below Class II significance levels and Class I PSD increments.

The maximum predicted annual $PM_{10}$ impact from the Proposed Action in the town of Sheridan is 0.27 µg/m$^3$. This is below the "significant impact level" of 1.0 µg/m$^3$ that would be deemed to cause or contribute to an exceedance of the AAQS in the Sheridan non-attainment area.

Air quality impacts resulting from, or associated with, mining operations would be limited primarily to the operational life of the mine. During the time the PSO Tract is mined, the elevated levels of particulate matter in the vicinity of the mining operations would continue, as would the elevated concentrations of gaseous emissions due to fuel combustion. Compliance with all state and federal air quality standards would be maintained. Mining would occur near State Highway 338, the Ash Creek Road and the Youngs Creek Road making dust visible to the public. The required mitigation measures, which are discussed in Section 4.6, would minimize this impact.

### 4.4.5 Water Resources

#### Surface Water

Changes in runoff characteristics and sediment discharges would occur during mining of the PSO Tract as a result of the destruction and reconstruction of drainage channels as mining progresses. Erosion rates could reach high values on the disturbed area because of vegetation removal. However, both state and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards. Generally, the surface runoff sediment is deposited in ponds or other sediment-control devices inside the permit area.

A hydrologic control plan for the proposed Ash Creek Mine would be designed to prevent surface runoff from interfering with the mining operations and to maintain the quantity and quality of the waters as they occur on and adjacent to the tract. Streamflow in Little Youngs and Youngs Creeks would be diverted around the active mining areas in temporary diversion ditches. Due to its location in the headwater area of West Branch, runoff from that drainage is not expected to be substantial; therefore, the hydrologic control would probably consist of allowing runoff to accrue to the mine pit, where it would be treated and discharged according to the standards of WDEQ/WQD. A large flood control reservoir or temporary drainage diversion for this stream is not anticipated. If flood control impoundments are used in the operation, it would be necessary to evacuate them following major events to provide space for the next flood. All necessary diversion systems and drainage controls would be designed to prevent material damage and minimize adverse impacts to the hydrologic balance outside the permit area. All diversions and associated structures would be designed, using the BACT, to prevent additional contribution of suspended solids to streamflow outside the permit area, and protect the water rights of downstream users.

Several sediment ponds, alternative sediment control structures (i.e., gravel check dams, grass filters), and other BACT structures would be used as required to control surface water quality from mining and reclamation activities. Backfilling, regrading and seeding would be completed on a routine basis to minimize the amount of area disturbed and not reclaimed at any given time. Sediment produced by large storms (i.e., those equal to or greater than the 10-year, 24-hour storm events) could adversely impact downstream areas. WDEQ/LQD would require a monitoring program to assure that sediment ponds would always have adequate space reserved for sediment accumulation.

During mining, pit water, which originates from groundwater seepage into the pit and from rainfall runoff within the pit and its associated drainage area, would be pumped into treatment/sediment ponds where solids would be allowed to settle before being discharged into surface

waters outside the permit area. Effluent from the mine pits, which would predominantly be mixtures of naturally occurring groundwaters, should cause no detectable changes in the water quality of the receiving stream(s). Discharge quantity and quality would be monitored and reported according to WDEQ/LQD discharge permit requirements.

The loss of soil structure would act to increase runoff rates on the PSO Tract in reclaimed areas. The general decrease in average slope in reclaimed areas, discussed in Section 4.4.1, would tend to counteract the potential for an increase in runoff. Soil structure would gradually reform over time, and vegetation (after successful reclamation) would provide erosion protection from raindrop impact, retard surface flows and control runoff at approximately pre-mining levels.

After mining and reclamation are complete, surface water flow, quality, and sediment discharge from the PSO Tract would approximate pre-mining conditions. A goal of the reclamation plan would be to provide approximately the premining degree of erosional stability in the post-mining drainage system. In addition, the mine permit application would address the reconstruction of the irrigation systems and the acreage of irrigated land to insure the restoration of the identified AVF. These measures are required by state regulations and are therefore considered part of the Proposed Action.

Groundwater

Mining the area shown in Figure 2-2 as proposed by P&M would impact the groundwater resource quantity in three ways: 1) Mining would remove the coal aquifers on the mined land and replace them with unconsolidated backfill materials; 2) mining would remove the Little Youngs Creek and Youngs Creek alluvial aquifer where it crosses the mined land and temporarily interrupt the alluvial underflow until the alluvial materials are replaced; and 3) water levels in the coal and alluvial aquifers adjacent to the mine would continue to be depressed from the open pit on the PSO Tract. The area subject to lower water levels would be roughly in proportion to the area affected by mining.

Mining operations at the proposed Ash Creek Mine would remove the coal seam aquifers on 1,720 acres (Proposed Action) and replace them with backfill composed of an unlayered mixture of the shale, siltstone, and sand that make up the existing Fort Union Formation overburden and interburden. The operations at the proposed Ash Creek Mine would also remove the alluvial aquifer of Little Youngs and Youngs Creeks, outside of the PSO Tract, where they cross lands proposed for mining operations on private coal in the north half of Sections 22 and 23, T.58N., R.84W. As the mining operation progresses through the stream valleys, these alluvial materials would be selectively salvaged and stockpiled as they are

encountered in order to be replaced during reclamation.

Impacts to the local groundwater systems resulting from mining include completely dewatering the coal and extending drawdowns some distance away from the active mine area. The extent that drawdowns would propagate away from the mine pits would be a function of water-bearing properties of the aquifer material, the dimensions of the mine pit and the duration of time that the pit is open. Due to the hydraulic nature of confined versus unconfined aquifers, broader, shallower drawdown is expected in confined aquifers (having low storativity), and steeper, more localized drawdown is expected in unconfined aquifers (having high storativity). In material with high transmissivity and low storativity, drawdowns would extend further from the pit face than in materials with lower transmissivity and higher storage. As discussed in Section 3.4.6, the Fort Union coal seam aquifers in this area have relatively low hydraulic conductivities and are typically confined, while the alluvial aquifer has a relatively high hydraulic conductivity and is unconfined.

As described in Section 3.4.6, the reclaimed PSO No.1 Mine/Ash Creek Mine is located within a coal aquifer flow system bound by regional northeast-trending faults that isolate groundwater flow to the northwest and southeast. Under baseline conditions, groundwater flow direction in the coal seams is generally northeastward, controlled by hydrogeologic boundaries created by these northeast-trending faults. Recharge to the system occurs where the seams contact clinker deposits in the uplands to the west and southwest of the PSO Tract, and generally wherever they subcrop beneath saturated alluvial deposits. Most discharge from the coal seams occurs to the east and northeast of the proposed Ash Creek Mine, along the Tongue River. Potentiometric drawdowns associated with mine pit dewatering would be confined within the northeast-trending fault block created by these hydrologic boundaries. In other words, the faults are assumed to be absolute barrier boundaries and no drawdowns would occur across them due to the stratigraphic displacements. In addition, structural faults have been observed to be barrier boundaries that restrict potentiometric drawdowns in the coal seams in the area of the Decker and Spring Creek Coal Mines.

Groundwater level declines in the coal seam aquifers during active mining would be strongly controlled by faults that serve as barriers to groundwater flow and by the coal seam outcrops and subcrops. Due to erosion and burning, the Dietz 1 and Dietz 3 coal seams are not continuous to the southwest; therefore, drawdowns can extend only to the northeast for any appreciable distance from the mine. The extent of the potentiometric head declines in these two coal seams would probably be limited to the effective increase in the coal transmissivity where the seams coalesce downdip (northeast) of the

PSO Tract, and the proximity to the seams' outcrops, subcrops, and recharge sources.

Potentiometric declines are a function of distance from the pit and the hydrologic barriers and boundaries such as crop lines, recharge sources, structural faults, and coal seam divergence lines. The Dietz 1 seam subcrops beneath the saturated alluvium of Little Youngs Creek within the proposed Ash Creek Mine area. Furthermore, the Dietz 1 and Dietz 3 seams coalesce only a short distance downgradient, northeast of the subcrop/ recharge zone; therefore, it is assumed that the Dietz 1 and Dietz 3 seams northeast and east of the mine area would respond as one aquifer. Drawdowns in the Dietz 1/Dietz 3 unit would be primarily governed by water levels in the alluvium until the mining operation has progressed across the alluvial valley of Little Youngs Creek. Maximum drawdown of the potentiometric surface in the coal would therefore not occur until after mining has removed this recharge source.

Water level data showing the drawdowns and recovery in the immediate vicinity of the PSO No.1/Ash Creek Mine pit are included each year in P&M's annual hydrology report to the WDEQ/LQD. As stated in Section 3.4.6, groundwater levels in the coal seams have rapidly recovered since the PSO No. 1 Mine pit was backfilled, and potentiometric levels have nearly reached predisturbance equilibrium (P&M 2001). Therefore, predictions of the potentiometric drawdown that result from mining the PSO Tract are based upon the predisturbance potentiometric surface elevations in the coal seam aquifers.

Significant stream recharge and fault barrier boundaries exist in the vicinity of the proposed Ash Creek Mine site. It is expected therefore that in a relatively short period of time after the initial pit is opened, the affected area would intercept barrier and recharge boundaries, thus reestablishing a steady-state condition. The PSO No. 1 Mine permit (Ash Creek Mining Company 1984) used a one-dimensional flow equation in consideration of aquifer recharge and barrier boundaries to estimate the steady-state groundwater pit inflow rates and the maximum potential head declines in the coal seams.

The predicted drawdown over the life of mine resulting from the Proposed Action is shown in Figure 4-3. The drawdown configuration depicted is a composite of that expected to occur in the combined Dietz 1/Dietz 3 coal seam. This prediction is approximate and was based on extrapolation of the Ash Creek Mining Company's earlier prediction by extending the drawdown northeastward with respect to the configuration of P&M's proposed Ash Creek Mine. More precise predictions would be required in order to submit a permit application to the WDEQ/LQD.

As discussed in Chapter 3, in July 2001, the Wyoming SEO and Montana DNRC records indicated a

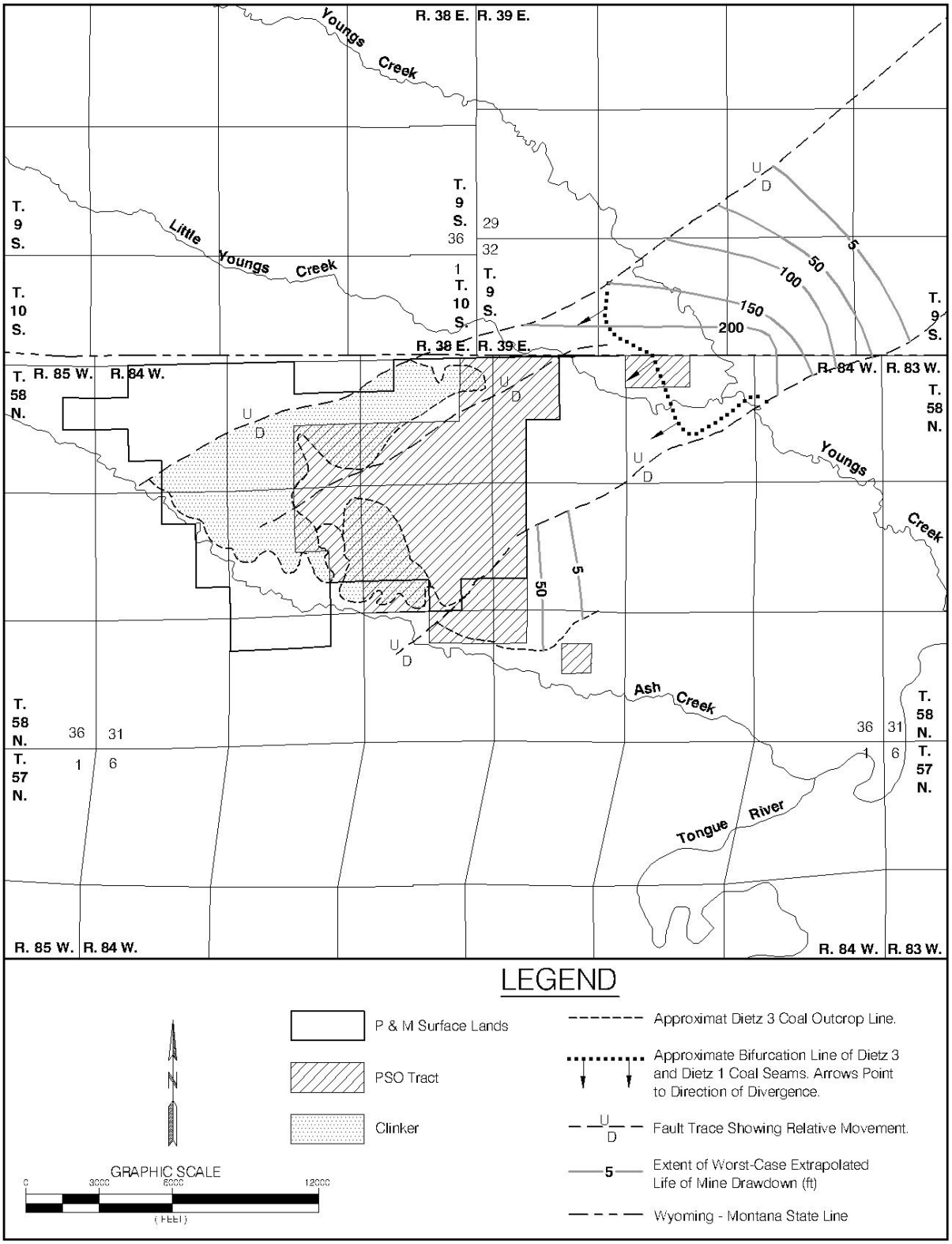



Figure 4-3. Life of Mine Drawdown Map, Resulting from Proposed Action.

total of 358 permitted water wells were located within three miles of the federal coal being considered for exchange, of which 345 are within Wyoming and 13 are within Montana. Of the 345 permitted wells in Wyoming, 83 are monitoring wells related to surface coal mining. There are 37 mine-related monitoring wells in Montana, although the DNRC does not require a Certificate of Water Right for scientific monitoring wells, as there is no beneficial use of water. Of the 275 other wells, 32 are permitted for stock watering, 16 are permitted for domestic use, 16 are permitted for stock watering and domestic use, 207 are permitted for both CBM development and stock watering, 3 are permitted for CBM development only, and one is permitted for miscellaneous use. In addition, a total of 76 CBM wells currently exist in Montana that are within a three mile radius of the federal coal being considered for exchange. Similar to monitoring wells, the State of Montana has ruled that a Certificate of Water Right is not required for a CBM well unless the discharge water is put to a beneficial use (i.e., stock watering). A listing of the 275 permitted wells that are not mining related monitoring wells is provided in Appendix E.

In compliance with SMCRA and Wyoming regulations, mine operators are required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality; this mitigation is thus part of the Proposed Action. The most probable source of replacement water would be one of the aquifers underlying the Dietz 3 coal seam.

The potential for drawdown to affect neighboring groundwater users would be minimal. This determination was based on the finding that there are just two known groundwater right holders within the area of the 5-ft drawdown contour, assuming both well completion depths are such that they produce water from the Dietz 1/Dietz 3 coal seam. As depicted by Figure 4-3, the extrapolated life of mine drawdown in the Dietz 1/Dietz

Table 4-7. Water Supply Wells Possibly Subject to Drawdown if the PSO Tract is Mined.

| Montana DNRC Permit No. | Applicant | Use |
|---|---|---|
| W183826-00 | Shell Mining Co. | Domestic |
| W183658-00 | Consolidation Coal Co. | Stock |

Note: Wells in this table are assumed to be completed within the shallowest groundwater production zone which should be the Dietz 1/Dietz 3 coal seam. Montana DNRC records do not indicate completion depths or depths to water for these wells.

3 seam would be confined between two major northeast-trending faults, and due to the mine's location adjacent to the state line, all drawdown effects would attenuate northeastward from the mine into Montana. Both of the groundwater rights within the affected area are in Montana. These wells are shown on Table 4-7. No groundwater supply wells are expected to be impacted in Wyoming if the PSO Tract is mined.

During the permitting process, the mine operator would be required to update the list of potentially impacted wells and predict impacts to these and other water-supply wells within the 5-ft drawdown contour. The operator would be required to commit to replacing these water supplies with water of equivalent quality and quantity if they are affected by mining.

The sub-Dietz 3 coal Fort Union Formation aquifers would not be removed or disturbed by the proposed Ash Creek Mine, so they would not be directly impacted by the coal mining activity. If the decision is made to complete the exchange and P&M decides to construct a new mine, the mine plan may include the construction of mine water supply wells which would be completed in aquifers below the Dietz 3 seam.

When mining has progressed to the point at which Little Youngs Creek and Youngs Creek must be diverted away from the operation, the affected alluvial materials would be selectively salvaged and stockpiled as they are encountered. As a result, groundwater levels in the undisturbed alluvial system would be depressed locally near the excavation. As mining progresses across the alluvial valleys, the backfill would be placed and graded to an elevation approximating the pre-mining base of alluvium and the salvaged alluvial materials would be replaced. The restored alluvial substrate and stream channels would then be reconstructed in order to restore the pre-mining hydrologic balance and the hydrologic functions of the AVF.

Mining would also impact groundwater quality; the TDS in the water resaturating the backfill is generally higher than the TDS in the groundwater before mining. This is due to the exposure of fresh overburden surfaces to groundwater that moves through the reclaimed backfill. Research conducted by the MBMG on the coal fields of the northern PRB (Van Voast and Reiten 1988) indicates that upon initial saturation, mine backfill is generally high in TDS and contains soluble salts of calcium, magnesium and sodium sulfates. As the backfill resaturates, the soluble salts are leached by groundwater inflow and TDS concentrations tend to decrease with time, indicating that the long term groundwater quality in mined and off-site lands would not be compromised (Van Voast and Reiten 1988). Using data compiled from ten surface coal mines in the eastern PRB, Martin et al. (1988) concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. The same conclusions were

reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. Operations at the Decker Mine are located approximately six miles northeast of the proposed Ash Creek Mine (Figure 3-1). Post-mining groundwaters are therefore expected to be of better quality after one pore volume of water moves through the backfill than what is observed in the backfill today.

One well, BF-1 (Figure 3-6), was installed to monitor water level and water quality in the backfill at the reclaimed Ash Creek Mine. As reported in the Ash Creek Mine's latest Annual Mining and Reclamation Report (P&M 2001), four years after backfilling of the pit the TDS concentration of the water in the backfill appears to be declining slowly and is currently fluctuating at or near 2,500 mg/l. The present TDS concentration of groundwater sampled from Dietz 1 coal monitoring well WR-48 (Figure 3-6) is approximately 1,500 mg/l. Therefore, the TDS concentration observed in the Ash Creek Mine backfill is higher than that found in the undisturbed Dietz 1 coal seam aquifer, but it meets the Wyoming Class III Standards for use as stock water. The difference between the premining and post-mining TDS concentrations is likely to continue decreasing over time and the mine backfill groundwater TDS can be expected to meet the pre-mining coal seams' Wyoming Class III standards for use as stock water.

The hydraulic properties of the backfill aquifer reported in permit documents and annual reports of the nearby Big Horn and Decker Mines are comparable to the Fort Union coal seams. The data available indicate that the hydraulic conductivity of the backfill would be greater than or equal to pre-mining coal values, suggesting that wells completed in the backfill would provide yields greater than or equal to pre-mining coal wells.

Direct and indirect impacts to the groundwater system resulting from mining the PSO Tract would add to the cumulative impacts that would occur due to CBM development in the general area. These impacts are discussed in Section 4.8.5.

### 4.4.6 Alluvial Valley Floors

If P&M acquires the federal coal in the PSO Tract as proposed and subsequently applies for a permit to mine, the application submitted to the WDEQ/LQD must include an investigation determining the presence of AVFs within the proposed permit area. Based on a previous AVF declaration made on Little Youngs Creek within the PSO No.1 Mine permit area (Ash Creek Mining Company 1984), it is likely that portions of West Branch, Little Youngs Creek, and Youngs Creek within the proposed Ash Creek Mine permit area would have AVF characteristics. West Branch lies within the PSO Tract. The PSO Tract lies within the drainage area for Youngs Creek and Ash Creek, but the main stems of these two streams do

not fall within the boundary of the federal coal being considered for exchange. The information submitted in the permit application must be sufficient to allow the WDEQ/LQD to determine if an AVF exists, identify the essential hydrologic functions and determine if the AVF is significant to farming.

Impacts to designated AVFs are generally not permitted if the AVF is determined to be significant to agriculture. AVFs that are not significant to agriculture can be disturbed during mining, but they must be restored as part of the reclamation process. In order to restore the AVF, the physical and hydrologic characteristics of the AVF must be determined.

Disruptions to streamflow, which might supply AVFs on Youngs Creek downstream of the proposed Ash Creek Mine, would not be expected to be substantial. Groundwater intercepted by the mine pits would be routed through settling ponds to meet state and federal quality criteria. Assuming settling ponds would discharge to Youngs Creek, discharges would likely increase the frequency and amount of flows in Youngs Creek, thus increasing surface water supplies to downstream AVFs. No direct, indirect, or cumulative impacts are anticipated to off-site AVFs through mining of the PSO Tract.

### 4.4.7 Wetlands

As discussed in Chapter 3, general jurisdictional wetland inventories were completed in 2001 on the federal coal lands being considered for exchange and a total of 6.20 acres of jurisdictional wetlands comprised of man-made stock ponds were identified. If the decision is made to complete the exchange and P&M decides to construct a new mine as proposed, formal inventories would be completed and submitted to the COE as a required part of the mine permit application.

Existing wetlands located in the PSO Tract and adjacent lands proposed for mining would be destroyed by mining operations. COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. Replacement of functional wetlands on privately-owned surface may occur in accordance with agreements with the private landowners. During the period of time after mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands, but replacement would be in accordance with the requirements of Section 404 of the Clean Water Act, as determined by COE.

### 4.4.8 Vegetation

Under the Proposed Action, mining operations for the Proposed Ash Creek Mine would progressively remove the native vegetation on 2,595 acres on and near the PSO Tract. Short-term impacts associated with this vegetation removal would include

increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat for some wildlife species as a result of reduced species diversity, particularly big sagebrush, on reclaimed lands. However, grassland-dependent wildlife species and livestock would benefit from the increased grass cover and production.

Reclamation, including revegetation of these lands, would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to four years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until the end of mining. Grazing restrictions prior to mining and during reclamation would remove up to 100 percent of the proposed mine area from livestock grazing. This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to pre-mining levels within several years following seeding with the approved final seed mixture. Wildlife use of the area would not be restricted throughout the operations.

Re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the PSO Tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the pre-mining vegetation. At least 20 percent of the area would be reclaimed to native shrubs at an average density of one shrub per square meter as required by current regulations. Trees removed by mining operations would be returned to a density equal to pre-mining conditions. Estimates for the time it would take to restore trees and shrubs to pre-mining density levels range from 20 to 100 years. An indirect impact of this vegetative change could be decreased big game habitat carrying capacity. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond (a minimum of ten years), a diverse, productive, and permanent vegetative cover would be established on the PSO Tract. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed post-mining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Private landowners (Figure 3-9) would have the right to manipulate the vegetation on their lands as they desire once the reclamation bond is released.

On average, about 150 acres of surface disturbance per year of mining would occur on the PSO Tract at the proposed rate of production under the Proposed Action. By the time mining ceases, over 75 percent of these disturbed lands would have been reseeded. The remaining 25

percent would be reseeded during the following two to three years as the life-of-mine facilities areas are reclaimed.

The reclamation plan for the proposed Ash Creek Mine would include steps to control invasion by weedy (invasive nonnative) plant species. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land.

The climatic record of the western U.S. suggests that droughts could occur periodically during the life of the mine. Such droughts would severely hamper revegetation efforts, since lack of sufficient moisture would reduce germination and could damage newly established plants. Same-aged vegetation would be more susceptible to disease than would plants of various ages. Severe thunderstorms could also adversely affect newly seeded areas. Once a stable vegetative cover is established, however, these events would have similar impacts as would occur on native vegetation.

Changes expected in the surface water network as a result of mining and reclamation would affect the reestablishment of vegetation patterns on the reclaimed areas to some extent. The post-mining maximum slope would be 20 percent in accordance with WDEQ policy. The average reclaimed slope would not be known until WDEQ's technical review of the permit application is complete. No substantial changes in average slope are predicted.

Following reclamation, the PSO Tract would be primarily mixed prairie grasslands with graminoid/forb-dominated areas, and the overall species diversity would be reduced, especially for the shrub component. As indicated previously, following reclamation bond release, management of the privately-owned surface would revert to the private surface owner, who would have the right to manipulate the reclaimed vegetation.

Jurisdictional wetlands would fall under the jurisdiction of the COE. Detailed wetland mitigation plans would be required at the permitting stage to ensure no net loss of jurisdictional wetlands on the project area. Functional wetlands may be restored in accordance with the requirements of the surface landowner; there are 6.41 acres of public lands included in the PSO Tract, the remainder of the surface of the tract is privately owned.

The decrease in plant diversity would not seriously affect productivity of the reclaimed areas, regardless of the alternative selected, and the proposed post-mining land use (wildlife habitat and rangeland) would be achieved even with the changes in vegetative species composition and diversity.

### 4.4.9 Threatened, Endangered and Candidate Plant Species

Refer to Appendix C.

4.4.10 Wildlife

Local wildlife populations are directly and indirectly impacted by mining. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. The indirect impacts are longer term and may include a reduction in big game carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

Under the Proposed Action, big game would be displaced from portions of the PSO Tract to adjacent ranges during mining. Pronghorn would be most affected; however, none of the area within two miles of the PSO Tract has been classified as crucial or critical pronghorn habitat. Mule deer would not be substantially impacted, given that they are scattered throughout the site and there is suitable habitat available in adjacent areas. White-tailed deer would not be affected, as they are uncommonly observed on the PSO Tract and adjacent areas. Big game displacement would be incremental, occurring over several years and allowing for gradual changes in distribution patterns. Big game residing in the adjacent areas could be impacted by increased competition with displaced animals. Noise, dust and associated human presence would cause some localized avoidance of foraging areas adjacent to mining activities. On other surface mines, however, big game have continued to occupy areas adjacent to and within active mine operations, suggesting that some animals may become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. There would be more restrictions on big game movement on or through the tract, however, due to additional fences, spoil piles, and pits related to mining. During winter storms, pronghorn may not be able to negotiate these barriers. WDEQ guidelines require fencing to be designed to permit pronghorn passage to the extent possible.

Recently, the WGFD reviewed monitoring data which has been collected on mine sites in Wyoming for big game species and the monitoring requirements for big game species on those mine sites. Their findings concluded that the monitoring had demonstrated the lack of impacts to big game on

existing mine sites. No severe mine-caused mortalities have occurred and no long-lasting impacts on big game have been noted on existing mine sites. The WGFD therefore recommended that big game monitoring be discontinued on all existing mine sites. New mines would be required to conduct big game monitoring if located in crucial winter range or in significant migration corridors, neither of which apply to the PSO Tract.

There would be an increase in road kills related to mine traffic.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density and loss of trees, would cause a decrease in carrying capacity and diversity on the PSO Tract. Sagebrush and trees would gradually become re-established on the reclaimed land, but the topographic changes would be permanent.

Medium-sized mammals (such as coyotes, foxes, skunks and racoons) would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality. However, these animals would quickly rebound on reclaimed areas, as forage developed and small mammal prey species recolonized. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many retreat into burrows when disturbed. Therefore, populations of such prey animals as voles, mice, chipmunks, prairie dogs and rabbits would decline during mining. However, these animals have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that reclamation objectives to encourage the decolonization of small mammal communities are being achieved (Shelley 1992). The study evaluated sites at five mines in Campbell County, Wyoming.

Sage grouse are yearlong residents and are found on the PSO Tract and adjacent lands. An active lek was observed in April and May of 2001 at a location within the federal coal lands being considered for trade (Figure 3-8, Section 3.4.10). The two-mile radius from the lek, which identifies the area in which most hens would nest, covers most of the PSO Tract. This lek was active intermittently from 1979 through 2001 with a maximum number of males recorded at 31 in 1982. The impacts from mining the PSO Tract would be the temporary loss of nesting habitat and disturbance to breeding activities when the mining operations approach to within close proximity of the birds' strutting ground. Monitoring of sage grouse activities indicates that the birds frequently change lek sites. It is likely that if mining activities disturb a lek, sage grouse would use an alternate lek site for breeding activities. Efforts would also be made to reestablish shrubs on reclaimed lands, grade reclaimed lands to create

swales and depressions, and continue monitoring of sage grouse activity in the area before, during and after mining. These and other measures would be further developed in the WDEQ/LQD Permit to Mine application.

Other upland game bird species (i.e., sharp-tailed grouse, wild turkey, pheasant and gray partridge) that are found on the PSO Tract would be temporarily displaced to adjacent habitats during mining. These birds are highly mobile and can easily move to undisturbed areas. Their populations are relatively low; therefore, their relocations should not increase competition and mortality.

Mining the PSO Tract would not impact regional raptor populations; however, individual birds or pairs may be impacted. Numerous raptor species have been observed on or adjacent to the PSO Tract, as there is abundant suitable nesting habitat (bluffs and tall trees) in the area. As noted in Section 3.4.10, a total of six raptor species (the great horned owl, red-tailed hawk, golden eagle, prairie falcon, Cooper's hawk and American kestrel) have been identified nesting within one mile of the area proposed for mining. In 2001, six nest sites in this area were active and included two golden eagle nests, three red-tailed hawk nests and one great horned owl nest. Two raptor species (the red-tailed hawk and the great horned owl) have been recorded nesting on the PSO Tract, both of which fledged young in 2001. P&M monitors territorial occupancy and nest productivity within the permit area for the reclaimed PSO No.1/Ash Creek Mine site and a one-mile radius in the winter, spring and early summer. Mining activity could cause raptors to abandon nests proximate to disturbance. USFWS recommends a 1-mile buffer around all ferruginous hawk nests. USFWS and WDEQ/LQD approval would be required before mining would occur within buffer zones for future or adjacent active raptor nests. Mine-related disturbances would not be allowed to encroach in the near vicinity of any active raptor nest from March until hatching, and disturbances near raptor nests containing nestlings would be strictly limited to prevent danger to, or abandonment of, the young. These and other raptor mitigation measures and a raptor monitoring plan, as required by the USFWS and WDEQ/LQD, are part of the Proposed Action. Mining near raptor territories would minimally impact availability of raptor forage species. During mining, nesting habitat would be created by the excavation process (highwalls), as well as through enhancement efforts (nest platforms and boxes). After mining, the reclamation plan would reestablish the ground cover necessary for the return of a suitable prey base.

Displaced songbirds would have to compete for available adjacent territories and resources when their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. Losses would also occur when habitat disturbance coincides with egg

incubation and rearing of young. Impacts of habitat loss would be short-term for grassland species, but would last longer for tree- and shrub-dependent species. Concurrent reclamation would minimize these impacts. A diverse seed mixture planted in a mosaic with a shrubland phase would provide food, cover, and edge effect. Other habitat enhancement practices include the restoration of diverse land forms, direct topsoil replacement, and the construction of brush piles, snags and rock piles. A research project on habitat reclamation on mined lands within Campbell County, Wyoming, for small mammals and birds concluded that the diversity of song birds on reclaimed areas was slightly less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992).

Waterfowl and shorebird habitat on P&M's proposed Ash Creek mine site is minimal, and production of these species is very limited. Mining the PSO Tract would thus have a negligible effect on migrating and breeding waterfowl. Sedimentation ponds created during mining would provide interim habitat for these fauna. WDEQ and the COE would also require mitigation of any disturbed wetlands during reclamation, which would minimize impacts. If the replaced wetlands on the proposed Ash Creek mine site do not duplicate the exact function and/or landscape features of the pre-mine wetlands, waterfowl and shorebirds could be beneficially or adversely affected as a result

A minimal amount of low-quality fish habitat within Little Youngs Creek and Youngs Creek would be impacted within P&M's proposed Ash Creek Mine area when the streams are diverted around the operation. A hydrologic control plan would be designed to prevent adverse impacts to the hydrologic balance outside the permit area, thus maintaining the quantity and quality of surface waters and the existing fish habitat upstream and downstream of the diversions. The only fish present are common, widespread, non-game species. Those portions of creeks that are disturbed during mining would be restored during reclamation.

The impacts discussed above would apply to the Proposed Action and Alternative 3. The assessment of impacts to wildlife by the mining operations at the proposed Ash Creek Mine would be addressed during the WGFD's and the WDEQ/LQD's review of the mine permit application, and within the WDEQ/LQD's permit approval process.

### 4.4.11 Threatened, Endangered, and Candidate Wildlife Species

Refer to Appendix C.

### 4.4.12 Land Use and Recreation

The major adverse environmental consequences of the Proposed Action on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of other mineral development, particularly CBM development, on about 2,595 acres during active mining. Wildlife

(particularly big game) and livestock (cattle and sheep) use would be displaced while the tract is being mined and reclaimed.

Sections 3.4.11 and 4.4.2 of this document address the existing CBM wells within and adjacent to the federal coal lands being considered for exchange. Well location information, federal oil and gas ownership, and federal oil and gas lessee information are presented in Figure 3-10 and Table 3-8. CBM is currently being produced on lands adjacent to the PSO Tract. Any well facilities associated with drilling and producing CBM would have to be removed prior to mining. Royalties, income, and taxes would be lost if the CBM is not recovered prior to mining or if coal is not recovered due to conflicts. CBM that is not recovered prior to mining is vented to the atmosphere. The costs of agreements between the CBM and the coal operators would be factored into the fair market value determination. In this case, the fair market value determination would affect how much federal coal would be offered for exchange with the P&M properties.

Within the boundary of the federal coal being considered for exchange are 6.41 acres of federal land (Lot 1 of Section 15, T.58N., R.84W, shown in Figure 3-9). This area would be removed from public access if the exchange is completed under the Proposed Action.

Hunting on the PSO Tract would be eliminated during mining and reclamation. P&M owns the surface of most of the PSO Tract and does not presently allow hunting.

Following reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses. There are no USFS surface lands and only 6.41 acres of BLM surface lands included in the PSO Tract, but the reclamation standards required by SMCRA and Wyoming state law meet the standards and guidelines for healthy rangelands for public lands administered by the BLM in the State of Wyoming. Following reclamation bond release, management of the privately-owned surface would revert to the private surface owner.

### 4.4.13 Cultural Resources

The PSO Tract and the adjacent surface lands owned by P&M were subjected to a Class III cultural inventory and assessment in August 2000.

Table 3-9 (Section 3.4.12) summarizes the distribution of cultural sites by type. Data recovery plans are required for those sites recommended eligible to the NRHP following testing and consultation with the SHPO. Until consultation with SHPO has occurred and agreement regarding NRHP eligibility has been reached, all sites should be protected from disturbance.

Consultation with SHPO would be completed during the mining permit approval process. Sites that are determined to be unevaluated or eligible for the NRHP through

consultation would receive further protection or treatment. If unevaluated sites cannot be avoided, they must be evaluated prior to disturbance. If eligible sites cannot be avoided, a data recovery plan must be implemented prior to disturbance. Ineligible properties may be destroyed without further work.

The eligible sites on the PSO Tract which cannot be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation or data recovery plan is developed to address the impacts to the sites. The lead federal and state agencies would consult with Wyoming SHPO on the development of such plans and the manner in which they are carried out.

Cultural resources adjacent to the mine areas may be impacted as a result of increased access to the areas. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits outside of but adjacent to mine permit areas.

### 4.4.14 Native American Concerns

No sites of Native American religious or cultural importance are known to occur on the PSO Tract. If such sites or localities are identified, appropriate action must be taken to address concerns related to those sites.

### 4.4.15 Paleontological Resources

No unique or significant paleontological resources have been identified or are suspected to exist on the PSO Tract. The likelihood of encountering significant paleontological resources is very small.

### 4.4.16 Visual Resources

Mining activities on most of the PSO Tract would be partially visible from the major travel route in the area (Wyoming State Highway 338). The mining operation would be largely concealed by the surrounding rugged terrain.

No unique visual resources have been identified on or near the PSO Tract, but the mining operations would affect landscapes classified as VRM Class II by BLM. There are 6.41 acres of BLM land included in the PSO Tract; however, the proposed facilities would be located on private lands. The Sheridan County Growth Management Plan identifies the need for an inventory of existing resources, including scenic resources, and the utilization of this information in the review and evaluation of proposed developments. Currently no procedure or ordinance exists that provides for this evaluation and review.

The proposed Ash Creek Mine would require a 24,000-ft long overland conveyor running due south from the mine's facilities area to a loadout facility on the BNSF mainline located near the recently reclaimed Big Horn

Coal Mine's loadout facility. Again, due to the area's rugged terrain and relatively remote location, the conveyor would be largely concealed. Only where the conveyor would crest over hilltops should it be visible from any major travel routes in the area.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) than the surrounding undisturbed terrain, and sagebrush and trees would not be as abundant for several years; however, within a few years after reclamation, the mined land would not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

4.4.17 Noise

Noise levels on the PSO Tract would be increased considerably by mining activities such as blasting, loading, hauling, and coal crushing. No rail car loading would take place on the proposed Ash Creek mine site. An overland conveyor would be used to transport the coal to a unit train loadout facility on the BNSF mainline about 4½ miles south of the mining operation thereby reducing noise levels on the tract.

The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 dBA prevents hearing loss and that a level below 55 dBA, in general, does not constitute an adverse impact. OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) which determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. Explosives would be used during mining to fragment the overburden and coal and facilitate their excavation. The air overpressure created by such blasting is estimated to be 123 dBA at the location of the blast. At a distance of approximately 1,230 ft, the intensity of this blast would be reduced to 40 dBA. The nearest occupied dwelling is roughly ¼ mile (1,320 feet) away from the PSO Tract.

Because of the remoteness of the mine site and associated overland conveyor, noise would have little off-site effect. Local residents in the Ash Creek and Youngs Creek areas would likely be affected by the increased noise levels. Wildlife in the immediate vicinity of mining may be adversely affected. Observations at surface coal mines in the eastern PRB (Campbell County) indicate that wildlife generally adapt to increased noise associated with active coal mining. After mining and reclamation are completed, noise would return to pre-mining levels.

4.4.18 Transportation Facilities

The only new or reconstructed transportation facilities required under the Proposed Action would be the overland conveyor and coal loadout facilities south of the new mine. Essentially all of the coal mined would be transported by rail. Vehicular traffic to and from the mine would increase from existing levels

since the employees would use State Highway 338, the same route used by employees at the Decker and Spring Creek Mines.

The Wyoming Department of Transportation routinely monitors traffic volumes on area highways, and if traffic exceeds design standards improvements are made. Burlington Northern-Santa Fe has upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected from the PRB with or without the operation of the proposed Ash Creek Mine. No active pipelines currently cross the mine property. Pipelines for collecting and transporting CBM would be constructed if the existing and proposed CBM wells start producing.

4.4.19 Socioeconomics

Exchange of the federal coal and subsequent acquisition of private coal adjacent to the PSO Tract by P&M would enable the opening of a new mine. Projected coal production would be 10 million tons per year by the end of the third year and production would continue at that rate for another 14 years under the Proposed Action.

P&M estimates that a selling price of $8.00 per ton would be needed to justify the expense of opening a new mine. At this price, the revenue from the sale of the recoverable coal from the Ash Creek Mine would total $1,164 million for the Proposed Action (145.5 million tons of coal). Some of the money from the sale of this coal would be paid to state and local governments in the form of taxes, as discussed below. The federal government would collect no royalty since the coal would no longer be federally owned.

According to a study done by the University of Wyoming (UW 1994), the State of Wyoming received about $1.10 per ton from the sale of PRB coal produced in 1991. The taxes and royalties included in this calculation were severance taxes, ad valorem taxes, sales and use taxes, and the state's share of federal royalty payments on production. Since there would be no federal royalties on the exchanged coal, the revenues to the state under the Proposed Action would be somewhat less than this amount. The federal royalty is 12½ percent of the sale price, of which the state receives half. In 1994, when the University of Wyoming study was done, the average price for PRB coal was $5.62 per ton (WSGS 2001a). Most of the coal sold in 1994 was federal coal, and the state's share of federal royalty was 6.25 percent of the sale price ($5.62), or about $0.35 per ton. Thus, without the federal royalty, the net benefit to Wyoming in the 1994 University of Wyoming study would have been about $0.75 per ton. At that rate, the estimated total direct return to the State of Wyoming from the production of the coal in the Ash Creek Mine, in current dollars, would be $109 million (based on 145.5 million tons of recoverable coal).

If the Ash Creek Mine is operated as described under the Proposed Action and annual coal production is 10

million tons, P&M anticipates that the average number of employees at the Ash Creek Mine would be 70 over the 17 years the property would be mined. These 70 persons would represent about 0.5 percent of the 4,172 persons in the April 2001 labor force in Sheridan County (Wyoming Department of Employment, Employment Resources Division, 2001b). The April 2001 unemployment in Sheridan County was about 508. No additional demands on the existing infrastructure or services in these communities would be expected because no influx of residents would be needed to fill new jobs. The potential contributions of the proposed Ash Creek Mine to Sheridan County would offset the closure of the Big Horn Coal Mine in 2000. As discussed in Chapter 3, production at the Big Horn Mine peaked in 1981 at 4 million tons per year and employment peaked at about 300 (Sheridan Press, March 12, 1994). Assessed valuation of the mine had dropped from a peak of $65 million to $2.7 million in 1994.

At a production rate of 10 million tons per year and a sale price of $8.00 per ton, the value of annual production at the Ash Creek Mine would be $80 million. In 2000, the assessed valuation of Sheridan County was $145,093,161, on which the total property tax levy was $10,110,818 (Wyoming Taxpayer's Association July 2001). The total mill levy was therefore 69.7. The value of coal production (10 million tons per year at $8 per ton) at the Ash Creek Mine would represent a 55% increase over the 2000 assessed valuation of the county and would increase property taxes by $5.7 million to about $15.8 million. The county would also see increased sales and use tax revenues, particularly from goods purchased during mine construction. The state would realize revenues from severance taxes, a portion of which is returned to local governments. The severance tax rate on surface coal is 7% (Wyoming Department of Revenue 2001). Under the Proposed Action severance taxes would total about $5.6 million per year.

During scoping, one commentor asked what the tax impacts would be if the P&M lands are exchanged and become federally owned. At present, property taxes paid to the counties by P&M include about $440 per year to Lincoln County (Bridger lands), $660 per year to Carbon County (JO Ranch lands) and $3,600 to Sheridan County (Welch lands). These property taxes would no longer be payable by P&M to the respective counties if the exchange is completed.

These tax payments would be partially offset by Payments in Lieu of Taxes (PILT) and 25 Percent Funds. BLM and USFS distribute these funds to units of local government (e.g., counties) that contain certain federally owned lands within their boundaries. The amount of the PILT payments is determined by several codified formulas (USC 6901-07) and is designed to supplement other federal land revenue-sharing payments that county government may be receiving.

The 25 Percent Funds are paid by the USFS (25 percent of National Forest Fund receipts) to units of local government as proxies for property taxes on the land.

Total PILT payments to Wyoming in 1997 were about $7.5 million. Payments to Wyoming from National Forest receipts totaled $1.8 million that year (USDA 2001). Lincoln County, where the Bridger lands are located, received $93,822.86 in payments from the USFS in 1997 (USFS August 2001).

The PILT and 25 Percent Fund payments would increase incrementally if these private lands exchanged into public ownership, but the payments would not totally offset the current property taxes on these parcels. As a general rule, it has been found that the overall tax liability on Federal lands is almost three times the Federal payments (Schuster, et al., September 1999). If this relationship holds true in this case, the net loss of property taxes to the respective counties (assuming federal payments would be one-third of taxes) would be $290 to Lincoln County, $440 to Carbon County and $2,400 to Sheridan County.

Issues relating to the social, cultural, and economic well-being and health of minorities and low-income groups are termed Environmental Justice issues. In reviewing the impacts of the Proposed Action on socioeconomic resources, surface water and groundwater quality, air quality, hazardous materials, or other elements of the human environment in this chapter, it was determined that potentially adverse impacts do not disproportionately affect Native American tribes, minority groups and/or low-income groups.

With regard to Environmental Justice issues affecting Native American tribes or groups, the analysis area contains no tribal lands or Native American communities, and no treaty rights or Native American trust resources are known to exist for this area. The northwest corner of the federal coal tract P&M wants to acquire is close to but is not directly contiguous with the southeast corner of the Crow Indian Reservation (Figure 3-1).

Implementing any of the alternatives would have no effects on Environmental Justice issues, including the social, cultural, and economic well-being and health of minorities and low income groups within the general analysis area.

### 4.4.20 Hazardous and Solid Waste

The types of solid wastes that would be generated in the course of mining the PSO Tract are described in Chapter 2. The procedures that would be used for handling hazardous and solid waste at the proposed Ash Creek Mine are also described in Chapter 2. Wastes generated by mining the PSO Tract would be handled in accordance with the existing regulations as described in Chapter 2.

## 4.5 No-Action Alternative

Under the No-Action Alternative, the exchange would not be completed. P&M would retain ownership of the lands that they have offered for exchange. The federal coal included within the PSO Tract would remain in federal ownership. The federal coal being considered for exchange could be leased and mined in the future; however, for the purposes of this analysis, the No-Action Alternative assumes that these federal coal lands would not be mined in the foreseeable future. This assumption allows a comparison of the economic and environmental consequences of mining these lands versus not mining them.

Under the No-Action Alternative, the Welch lands, JO Ranch lands and Bridger lands would remain in private ownership. The Bridger lands would remain private in-holdings in the BTNF and the BLM Pinedale Field Area. The JO Ranch lands, including the JO Ranch buildings, which are eligible for National Historic Site status, would remain private in-holdings in the BLM Rawlins Field Area. The Welch lands, which represent a unique opportunity for public access to the Tongue River in Wyoming outside of the Big Horn National Forest, would remain in private hands. For the purpose of this analysis, no other assumption is made about the future use of these lands. However, based on information P&M has provided, it is likely that these lands would be sold on a competitive bid basis. These sales could result in subdivision and rural development of these lands.

Under the No-Action Alternative the Ash Creek Mine would not be opened as proposed and the impacts described on the preceding pages and in Table 2-3 to topography and physiography, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would not occur on the PSO Tract. Furthermore, the general nature and magnitude of cumulative impacts resulting from the Proposed Action, as summarized in Table 2-4, would not occur under the No-Action Alternative.

The economic benefits that would be derived from mining the PSO Tract would be lost.

## 4.6 Regulatory Compliance, Mitigation, and Monitoring

No impacts requiring mitigation or monitoring have been identified related to BLM and USFS acquisition of the Bridger, JO Ranch, or Welch Ranch Lands.

In the case of the PSO Tract, SMCRA and state law require a considerable amount of compliance requirements, mitigation and monitoring for surface coal mining operations. Measures that are required by regulation are considered to be part of the Proposed

Action. If the exchange is completed and P&M decides to mine the coal beneath the PSO Tract, these requirements, mitigation plans, and monitoring plans would be part of a mining and reclamation plan covering the proposed Ash Creek Mine. This mining and reclamation plan would have to be approved before mining could occur on the PSO Tract. The major mitigation measures and monitoring measures that are required by state or federal regulation are summarized in Table 4-8. More specific information about some of these mitigation and monitoring measures are described in the following sections of this document:

- Section 4.4.2, handling of unsuitable overburden material;
- Section 4.4.4, air quality monitoring practices and application of BACT for mitigation of air quality impacts;
- Section 4.4.5 surface water hydrologic control measures;
- Section 4.4.5, groundwater quantity and quality monitoring measures;
- Section 4.4.5, mitigation for interruption, discontinuation, or diminishment of existing water well rights by mining operations;
- Section 4.4.6, restoration of AVFs impacted by mining;
- Section 4.4.7, identification and replacements of wetlands impacted by mining;
- Section 4.4.8, plans for control of invasive, nonnative plant species;
- Section 4.4.10, fencing designed to permit pronghorn passage;
- Section 4.4.10, notification and mitigation measures to protect active raptor nests and nest productivity;
- Section 4.4.10, mitigation measures to minimize habitat loss impacts to songbirds;
- Section 4.4.13, protection of cultural resources that are recommended eligible for or of undetermined eligibility for the NRHP; and
- Appendix C, protection of threatened and endangered species.

In general, the levels of mitigation and monitoring required for surface coal mining by SMCRA and Wyoming state law are more extensive than those required for other surface disturbing activities; however, concerns are periodically identified that are not monitored or mitigated under existing procedures. One issue of recent concern has been the release of $NO_x$ from blasting and the resulting formation of low-lying orange clouds that can be carried outside the mine permit areas by wind.

As a result of this concern, WDEQ has directed some PRB coal mines to take steps designed to mitigate the effects of $NO_2$ emissions during overburden blasting. The steps that may be required include: public notifications (in the form of warning signs along public roadways, for example); temporary closure of public roadways near a mine during and

Table 4-8. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action).

| RESOURCE | Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1] | MONITORING[1] |
|---|---|---|
| Topography & Physiography | Restoring to approximate original contour or other approved topographic configuration | LQD checks as-built vs. approved topography with each annual report. |
| Geology & Minerals | Identifying & selectively placing or mixing chemically or physically unsuitable overburden materials to minimize adverse effects to vegetation or groundwater | LQD requires monitoring in advance of mining to detect unsuitable overburden. |
| Soil | Salvaging soil suitable to support plant growth for use in reclamation;<br>Protecting soil stockpiles from disturbance and erosional influences;<br>Selectively placing at least 4 ft of suitable overburden on the graded backfill surface below replaced topsoil to meet guidelines for vegetation root zones | Monitoring vegetation growth on reclaimed areas to determine need for soil amendments. Sampling regraded overburden for compliance with root zone criteria. |
| Air Quality | Dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air;<br>Using particulate pollution control technologies;<br>Using work practices designed to minimize fugitive particulate emissions;<br>Using EPA- or state-mandated BACT, including:<br>Fabric filtration or wet scrubbing of coal storage silo and conveyor vents,<br>Watering or using chemical dust suppression on haul roads and exposed soils,<br>Containment of truck dumps and primary crushers,<br>Covering of conveyors,<br>Prompt revegetation of exposed soils,<br>High efficiency baghouses on the crusher, conveyor transfer, storage bin and train loadout, meeting a standard of 0.01 grains per dry standard cubic foot (dscf) of exit volume,<br>Watering of active work areas,<br>Reclamation plan to minimize surface disturbances subject to wind erosion,<br>Paving of access roads | On-site air quality monitoring for $PM_{10}$ or TSP;<br>Off-site ambient monitoring for $PM_{10}$ or TSP;<br>On-site compliance inspections |
| Surface Water | Building and maintaining sediment control ponds or other devices during mining;<br>Restoring approximate original drainage patterns during reclamation;<br>Restoring stock ponds and playas during reclamation | Monitoring storage capacity in sediment ponds; monitoring quality of discharges; monitoring streamflow and water quality. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action). (continued)

| RESOURCE | Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1] | MONITORING[1] |
|---|---|---|
| Groundwater Quantity | Evaluating cumulative impacts to water quantity associated with proposed mining;<br>Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity | Monitoring wells track water levels in overburden, coal, interburden, underburden, & backfill. |
| Groundwater Quality | Evaluating cumulative impacts to water quality associated with proposed mining;<br>Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality | Monitoring wells track water quality in overburden, coal, interburden, underburden, & backfill. |
| Alluvial Valley Floors | Identifying all alluvial valley floors that would be affected by mining;<br>Determining significance to agriculture of all identified alluvial valley floors affected by mining (WDEQ);<br>Protecting downstream alluvial valley floors during mining;<br>Restoring essential hydrologic function of all alluvial valley floors affected by mining. | Monitoring to determine restoration of essential hydrologic functions of any declared AVF. |
| Wetlands | Identifying all wetlands that would be affected by mining;<br>Identifying jurisdictional wetlands (COE);<br>Replacing all jurisdictional wetlands that would be disturbed by mining;<br>Replacing functional wetlands as required by surface managing agency or surface land owner | Monitoring of reclaimed wetlands using same procedures used to identify pre-mining jurisdictional wetlands. |
| Vegetation | Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area;<br>Reclaiming 20% of reclaimed area with native shrubs at a density of one per square meter;<br>Controlling erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures;<br>Chemically and mechanically controlling weed infestation;<br>Direct hauling of topsoil;<br>Selectively planting shrubs in riparian areas;<br>Planting sagebrush;<br>Creating depressions and rock piles;<br>Using special planting procedures around rock piles;<br>Posting reclamation bond covering the cost of reclamation | Monitoring of revegetation growth & diversity until release of final reclamation bond (minimum 10 years). Monitoring of erosion to determine need for corrective action during establishment of vegetation. Use of controlled grazing during revegetation evaluation to determine suitability for post-mining land uses. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action). (continued)

| RESOURCE | Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1] | MONITORING[1] |
|---|---|---|
| Wildlife | Restoring pre-mining topography to the maximum extent possible;<br>Planting a diverse mixture of grasses, forbs and shrubs in configurations beneficial to wildlife;<br>Designing fences to permit wildlife passage;<br>Raptor-proofing power transmission poles;<br>Creating artificial raptor nest sites;<br>Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land;<br>Cottonwood plantings along reclaimed drainages;<br>Replacing drainages, wetlands and alluvial valley floors disturbed by mining;<br>Reducing vehicle speed limits to minimize mortality;<br>Instructing employees not to harass or disturb wildlife;<br>Preparing raptor mitigation plans | Baseline & annual wildlife monitoring surveys;<br>Monitoring for MBHFI. |
| Threatened, Endangered, & Candidate Species | Avoiding bald eagle disturbance;<br>Restoring bald eagle foraging areas disturbed by mining;<br>Restoring mountain plover habitat disturbed by mining;<br>Using raptor safe power lines;<br>Surveying for Ute ladies' tresses;<br>Surveying for mountain plover;<br>Searching for black-footed ferrets if prairie dogs move onto tract; | Baseline and annual wildlife monitoring surveys. |
| Land Use | Suitably restoring reclaimed area for historic uses (grazing and wildlife); | Monitoring of controlled grazing prior to bond release evaluation. |
| Cultural Resources | Conducting Class I & III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings;<br>Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP;<br>Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan;<br>Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations;<br>Instructing employees of the importance of and regulatory obligations to protect cultural resources | Monitoring of mining activities during topsoil stripping; cessation of activities and notification of authorities if unidentified sites are encountered during topsoil removal. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action). (continued)

| RESOURCE | Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1] | MONITORING[1] |
|---|---|---|
| Native American Concerns | Notifying Native American tribes with known interest in this area of leasing action and request for help in identifying potentially significant religious or cultural sites | No specific monitoring program |
| Paleontological Resources | Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining | No specific monitoring program |
| Visual Resources | Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species | No specific monitoring program |
| Noise | Protecting employees from hearing loss | MSHA inspections |
| Transportation Facilities | Relocating existing pipelines, if necessary, in accordance with specific agreement between pipeline owner and coal lessee. | No specific monitoring program |
| Socioeconomics | Paying royalty and taxes as required by federal, state, and local regulations. | Surveying and reporting to document volume of coal removed. |
| Hazardous & Solid Waste | Disposing of solid waste and sewage within permit boundaries according to approved plans;<br>Storing and recycling waste oil;<br>Maintaining of files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining;<br>Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable existing or hereafter promulgated federal, state, and government requirements;<br>Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended;<br>Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended;<br>Preparing emergency response plans | No specific monitoring other than required by these other regulations and response plans. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

after a blast; establishment of safe set-back distances from blasting areas; prohibiting blasting when wind direction is toward a neighbor; prohibiting blasting during temperature inversions; establishment of monitoring plans; estimation of $NO_2$ concentrations; and development of blasting procedures that will protect public safety and health.

## 4.7 Residual Impacts

Residual impacts are unavoidable impacts that cannot be mitigated and would therefore remain if the exchange is completed.

### 4.7.1 Topography and Physiography

No adverse residual topographic or physiographic impacts have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, topographic moderation would be a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

### 4.7.2 Geology and Minerals

No adverse residual geologic impacts have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, the geology from the base of the Dietz 3 coal to the surface would be subject to substantial, permanent change. CBM resources not recovered from the Dietz 1 and Dietz 3 seams in the mined areas prior to mining would be permanently lost.

### 4.7.3 Soils

No adverse residual impacts to soils have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, existing soils in the area of disturbance would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alteration of soil characteristics.

### 4.7.4 Air Quality

No adverse residual impacts to air quality have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, no residual impacts to air quality would occur following mining.

### 4.7.5 Water Resources

No adverse residual impacts to water resources have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, the post-mining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Water level and water quality in the backfill

would be suitable to provide water to wells for livestock use, but would be different from pre-mining conditions. No residual impacts to the replaced alluvial aquifer and alluvial groundwater would be expected. No residual impacts to the surface water system would be expected.

4.7.6 Alluvial Valley Floors

No adverse residual impacts to alluvial valley floors have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, no residual impacts to alluvial valley floors would be present following mining.

4.7.7 Wetlands

No adverse residual impacts to wetlands have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined as proposed, replacement of jurisdictional wetlands that would be affected by mining would be required. Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the pre-mining wetland.

4.7.8 Vegetation

No adverse residual impacts to vegetation have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined and reclaimed as proposed, reclaimed vegetative communities may never completely match the surrounding native plant community.

4.7.9 Wildlife

No adverse residual impacts to wildlife have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged, mined and reclaimed to near original condition as proposed, there would be some residual wildlife impacts. The topographic moderation would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species.

4.7.10 Threatened, Endangered, and Candidate Species

No adverse residual impacts to T&E or candidate plant or animal species have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined and reclaimed, no residual impacts to T&E or candidate plant or animal species are expected.

4.7.11 Land Use and Recreation

Any existing land use agreements between the private landowner and land users, such as grazing leases or recreational access, would be permanently changed on the Bridger Lands, JO Ranch Lands, and Welch

Lands if the exchange is completed. If the PSO Tract is exchanged, mined and reclaimed, no residual impacts to land use and recreation are expected.

4.7.12 Cultural Resources

No adverse residual impacts to cultural resources have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined and reclaimed, cultural sites that are determined to be eligible for the NRHP and that cannot be avoided would be destroyed by surface coal mining after data from those sites is recovered. Sites that are not eligible for the NRHP would be lost.

4.7.13 Native American Concerns

No residual impacts to Native American concerns have been identified.

4.7.14 Paleontological Resources

No residual impacts to significant paleontological resources would be expected.

4.7.15 Visual Resources

No adverse residual impacts to visual resources have been identified for the Bridger Lands, the JO Ranch Lands, or the Welch Lands if the exchange is completed. If the PSO Tract is exchanged and mined and reclaimed, no residual impacts to visual resources are expected.

4.7.16 Noise

No residual impacts to noise are expected.

4.7.17 Transportation Facilities

No residual impacts to transportation facilities are expected.

4.7.18 Socioeconomics

Current taxes paid to state and local governments by the private landowner would be permanently ended on the Bridger Lands, JO Ranch Lands, and Welch Lands if the exchange is completed. If the PSO Tract is exchanged, mined and reclaimed, no residual impacts to socioeconomics are expected.

4.7.19 Hazardous and Solid Waste

No residual hazardous or solid waste impacts are expected.

## 4.8 Cumulative Impacts

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

This section briefly summarizes the cumulative impacts that are occurring as a result of existing development in the general area and would be expected to occur if the exchange is completed and the coal

included in the PSO Tract is mined as proposed and if other reasonably foreseeable development in the general vicinity occurs.

Important points to keep in mind include: 1) the total areas of all active surface coal mines near the Wyoming-Montana state line would not be disturbed at once; 2) the number of acres, type of vegetation, etc., disturbed would vary from year to year; 3) the impacts to groundwater would vary as mining progresses through the permit area (depending on saturation, how close the mine pit is to a hydraulic boundary, etc.); 4) the extent of groundwater impacts is greatly influenced by hydrologic boundary conditions such as structural fault displacements and alluvial subcrops; and 5) CBM development is ongoing and the extent of development must be estimated.

Other agencies may use this analysis to make decisions related to exchanging and mining the federal coal within the PSO Tract. OSM is a cooperating agency on this EIS in order to provide input on the exchange process and the impacts of the proposed mining operation.

Other projects that are in progress or planned in the Wyoming PRB include current and proposed CBM development; federal coal leasing in Campbell and Converse counties; construction and operation of the North American Power Group's Two Elk and Two Elk Unit 2 Power Plants east of the Black Thunder Mine; construction of Wygen #1 power plant to be located at the Black Hills Corporation energy complex near Gillette, Wyoming; construction and operation by North American Power Group of a 500-megawatt coal fired power plant at the Cordero Rojo Complex; and construction and use of the proposed DM&E rail line across portions of Campbell, Converse, Niobrara, and Weston counties. With the exception of CBM development, which is addressed below, the impacts of completing and operating these projects would not be expected to overlap with the impacts of mining the PSO Tract because the other proposed projects would all be located in the eastern PRB.

Cumulative mineral development in Sheridan County, Wyoming was evaluated in two previously prepared regional EISs. They are:

- *Final Powder River Regional Coal Environmental Impact Statement,* BLM, December, 1981; and

- *Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region*, BLM, January 1984. (A final EIS was not released for the proposed Round II coal lease sale in the Powder River Region and the sale was never held.)

These regional EISs projected development levels for coal, oil and gas and other minerals in the PRB in 1990 and 1995. In general, the current actual mineral development levels are at or below the levels

predicted in the regional EISs for 1990 and 1995. For example, the 1981 EIS projected that about 384 million tons of coal would be produced by mines in the eastern PRB (Campbell and Converse counties) in 1995. The actual 1995 coal production from the mines in the eastern PRB was about 246.5 million tons and the estimated 2001 production from those mines was 354 million tons. The 1981 EIS estimated that mines in the Sheridan area (Big Horn, Decker, and Spring Creek) would produce 23.7 million tons of coal per year in 1990 and 1995. Actual 1999 production from those mines was 22 million tons. The levels of production of natural gas are higher than projected in the regional EISs because CBM production levels were not anticipated in the 1990 and 1995 regional EISs. CBM production levels are discussed in more detail in the section on Geology and Minerals below (Section 4.8.2).

At this time, the development of CBM in the Tongue River drainage has been delayed by issues related to the quality of the produced water and whether that water should be discharged on the surface. If and when this issue is resolved, the rate of CBM development is likely to increase in the general area of the PSO Tract. Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality and wildlife are likely to occur. These potential impacts are considered in the following cumulative impact discussion for these resources.

### 4.8.1 Topography and Physiography

Following surface coal mining and reclamation, topography would be modified within the permit boundaries of the surface mines in the Sheridan area near the Wyoming-Montana state line, including the proposed Ash Creek Mine. The topography in the general vicinity of these surface mines is relatively diverse, ranging from the relatively flat, rolling terrain found in the lower reaches of the stream valleys to the relatively rugged terrain with steeply sloping ravines found in the uplands. After reclamation, the topography outside of the valley bottoms would be less rugged, more homogeneous and gentler. In general, pre-mining features that were more topographically unique (e.g., steeper hills and ravines, rock outcrops, etc.) would be smoothed with more uniform slopes.

The overall reduction in topographic diversity in the mine permit areas may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges are generally very large, mining activities are, in general, not located in habitats defined as crucial, and mining operations in this area are spread out rather than contiguous. The reduced relief and subdued topography could result in increased infiltration of surface water and reduced peak flows from the drainages. The reshaped land surface, being more uniform and subdued, could be less visually attractive to some observers, but these mine sites are separated by relatively rugged undisturbed

topography. The construction and operation of CBM wells and associated production facilities would cause minimal overlapping topographic and/or physiographic changes.

4.8.2 Geology and Mineral Resources

The PRB coalfield encompasses an area of about 12,000 $mi^2$. Finley and Goolsby (2000) estimate that there are approximately 587 billion tons of coal in beds thicker than 20 ft and deeper than 200 ft in the basin. Most of the current federal coal leases in the PRB include coal with overburden thicknesses of 200 ft or less. These coal reserves represent a small percentage of the total coal reserves but a large percentage of the shallowest (hence the most economical to recover) coal reserves.

Since 1990, the Wyoming State Office of the BLM has held fifteen competitive coal lease sales and issued eleven new federal coal leases containing approximately 3.284 billion tons of coal. BLM completed an exchange in the Powder River Basin in 2000, authorized by Public Law 95-554. Under this exchange, EOG resources (formerly Belco) received a federal lease for a 106-million ton coal tract adjacent to the Buckskin Mine in exchange for the rights to a 170-million ton coal lease near Buffalo, Wyoming that is unmineable due to construction of Interstate Highway 90 (BLM 1999).

Wyoming PRB coal production in 2001 was approximately 354 million tons. The PRB mines located in Campbell and Converse Counties, Wyoming produce 85 to 95 percent of the coal produced in the state each year.

Currently there are no active surface mines within Sheridan County, but there are currently two surface coal mines in operation near the Wyoming-Montana state line: the Spring Creek and Decker coal mines (Figure 3-1). Both mines are in Big Horn County, Montana, approximately six to ten miles northeast of the PSO Tract. Their 1999 productions and current maximum annual permitted production rates are shown in Table 4-9. Mining rates are expected to remain relatively constant at both these mines through the year 2016 depending upon market conditions.

The total area that has been permanently reclaimed at the Big Horn Coal Mine is 1,490 acres. Facility areas at the Big Horn Coal Mine that will remain indefinitely occupy 120 acres (Big Horn Coal Company 2001). The total area that was reclaimed at the old Hidden Water Pits is approximately 412 acres (Tim Richmond, August 2001). The total area to be disturbed within the permit boundary of Spring Creek Coal is 2,212 acres, while Decker Coal is permitted to disturb 11,417 acres. Thus the total area disturbed to date or permitted to be disturbed by surface coal mining in the Sheridan area is 15,791 acres.

Under the Proposed Action, approximately 2,595 acres would be disturbed. This would represent a 16

Table 4-9. Production of PRB Coal Mines Located in the Sheridan Coal Field Near the Wyoming-Montana State Line.

| | | Coal Production[1] | |
|---|---|---|---|
| Mine Name | Mine Operator | 1999 Actual[2] | Currently Permitted[3] |
| Decker | Kiewit Mining Group, Inc. | 10.9 | 16.0 |
| Spring Creek | Kennecott Energy Co. | 11.0 | 15.0 |
| | Totals | 21.9 | 31.0 |

1 Actual production (million tons) on left, permitted production (million tons) on right.

2 Source: Montana Coal Council 2001.

3 Source: Robert Jeffrey, MDEQ personal communication, August 15, 2001. Maximum capacities per current air quality permits are shown.

percent increase in the total area disturbed by surface mining in the Sheridan area.

The total area of disturbance for the two active mines and the proposed Ash Creek Mine throughout their combined lives would be 16,224 acres. This area of disturbance would be slightly greater than the total area of coal removal.

In the area of coal removal at the two existing mines and the proposed Ash Creek Mine, the geology would be disrupted, the coal would be recovered, and the overburden and topsoil would be replaced. The natural stratification of these shallow geologic layers would be destroyed in the area of coal removal, and the backfill would be a more homogenous mixture of shale, siltstone and fine-grained sandstone. All three mines plan to restore the mined lands to approximate pre-mining levels.

In 2000, natural gas production within the State of Wyoming was up 12.4 percent from 1999, reaching 151.2 billion cubic feet. CBM production accounted for 10.4 percent of the State's total gas production. This increase in gas production is attributed to higher natural gas prices in 2000 than in several preceding years and a large increase in CBM production in the PRB. In January 2001 the number of producing CBM wells in the PRB rose to 4,884 with 2,074 shut-in wells. Most of these wells have been drilled in Campbell County.

Natural gas production has been increasing in Sheridan County due to the development of CBM resources. Gas production in Sheridan County increased to 1.24 billion cubic feet in May 2001 from 72.42 million cubic feet in May 2000, a boost of 1600 percent (WOGCC July 2001). The WOGCC approved 1,967 APDs in the first quarter of 2001. The total for that quarter is more than the number of APDs approved in all of 1995, 1996, or 1997. Campbell County led with about 61 percent of the total

APDs; Sheridan and Johnson Counties combined for another 17 percent. Nearly all of the approved APDs in these three counties were for CBM tests (WSGS 2001b).

Since the early 1990s, the BLM has completed numerous EAs and two EISs analyzing CBM projects. The Wyodak CBM Project EIS, which was completed in 1999, evaluated an area which included 3,600 square miles of mixed federal, state, and private lands. The EIS analyzed the impacts of drilling and producing up to 5,000 new federal, state, and private CBM wells in addition to the 890 wells that had been evaluated in previous NEPA documents. BLM subsequently completed an EA to analyze the impacts of drilling as many as 2,500 additional federal drainage protection wells within the Wyodak EIS project area (BLM 2000). These wells are being drilled and produced to prevent the loss of federal CBM resources and corresponding royalties from undrilled federal oil and gas leases that are adjacent to and potentially being drained by wells drilled on private or state oil and gas leases.

BLM is also currently preparing an EIS to analyze the cumulative impacts of reasonably foreseeable CBM and conventional oil and gas development within the Wyoming portion of the PRB. This EIS is being prepared to analyze the potential impacts of proposed additional CBM development in the Wyoming portion of the basin and update the BLM planning documents in the area of CBM development interest. The PRB Oil and Gas Project Draft EIS was mailed to the public in January 2002. The USFS is a cooperating agency on this EIS.

CBM wells can be drilled on private and state oil and gas leases after approval by the WOGCC and the Wyoming SEO. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before CBM drilling on the federal leases can be authorized. In many areas of the PRB the coal rights are federally owned, but the oil and gas rights are privately owned. A June 7, 1999 Supreme Court decision (98-830) assigned the rights to develop CBM on a piece of land to the owner of the oil and gas rights.

CBM wells have been drilled on and around the PSO Tract. CBM drilling and production is expected to continue in the Ash Creek/Youngs Creek area, as well as farther north around the Decker and Spring Creek Coal Mines, farther south around the recently reclaimed Big Horn Coal Mine, and farther east.

Coal and CBM are non-renewable resources that form as organic matter decays and undergoes chemical changes over geologic time. The CBM and coal resources that are removed to generate heat and power would not be available for use in the future. No potential damages to the coal resulting from removal of the CBM and water prior to mining have been identified. The CBM operators generally do not completely dewater the coal beds to produce the CBM

because that could damage fractures in the coal and limit CBM production.

4.8.3 Soils

The Spring Creek and Decker coal mines would disturb about 13,629 acres throughout their combined lives (they would disturb about 300 acres annually during active mining at the currently planned mining rates). Approximately 2,020 acres were disturbed and 1,902 permanently reclaimed at the Big Horn Coal Mine and the Hidden Water Pits, for a total of approximately 15,791 acres of historic and permitted surface mine disturbance in the Sheridan area. If the decision is made to complete the exchange and the PSO Tract is mined, the disturbance area in this group of surface mines north of Sheridan would increase to approximately 18,385 acres. The Proposed Action would represent an additional 16 percent increase in surface disturbance by mining operations in the Sheridan area.

Excluding the permanently reclaimed Hidden Water Pits and Big Horn Coal Mine areas, and assuming ten years from initial disturbance to utilization of a parcel of reclaimed land by domestic livestock, roughly 1,500 acres would be unavailable for such use at any given time during active mining. This includes facilities areas at active mines that represent life-of-mine disturbances. However, the replaced topsoil should support a stable and productive native vegetation community adequate in quantity and quality to support planned post-mining land uses (i.e., rangeland and wildlife habitat). Areas within all three of the active mines (including the proposed Ash Creek Mine) would be progressively disturbed. Likewise, these areas would be progressively reclaimed in time by planting appropriate vegetation species to restore soil productivity and prevent soil erosion.

Additional, although less extensive, soil disturbance would be associated with the on-going CBM development predominantly east and south of the mines.

4.8.4 Air Quality

A PRB air quality impact assessment was prepared as part of the PRB Oil and Gas Project EIS under the direction of the BLM. This analysis was prepared to analyze the potential air quality impacts of the proposed CBM development in the Powder River Basin as well as other reasonably foreseeable emission sources in the basin. Coal mining is included as one of the other reasonably foreseeable emission sources. Coal mining data supplied by BLM for the analysis included estimated coal production volume (based on coal demand forecasts), annual acreage disturbance, and approximate location of mining activity for active mines in Wyoming and Montana during the years of estimated maximum cumulative activity in the basin.

This analysis was prepared under the requirements of NEPA to assess and disclose reasonably foreseeable impacts to both the public and the

BLM decision makers. Due to the preliminary nature of this NEPA analysis, it should be considered a "reasonable, but conservative" upper estimate of predicted impacts. Actual impacts at the time of development (subject to air pollutant emission source permitting) are likely to be less. The CBM-related results of this impact assessment are discussed in the PRB Oil and Gas Project Draft EIS (BLM 2002), and the air quality impact assessment technical document is available for review (Argonne 2001). The results of this cumulative impact analysis are summarized below.

The PRB cumulative air quality impact assessment was based on the best available engineering data and assumptions, meteorology data, and dispersion modeling procedures, as well as professional and scientific judgement. Where specific data or procedures were not available, "reasonable, but conservative" assumptions were incorporated.

Potential direct, indirect and cumulative air quality impacts were analyzed to predict maximum potential near-field ambient air pollutant concentrations and potential hazardous air pollutant (HAP) impacts, as well as to determine maximum far-field ambient air pollutant concentrations, visibility and atmospheric deposition (acid rain) impacts.

Based on a separate assessment predicting potential far-field (cumulative) air quality impacts (Argonne 2001), the EPA CALMET/CALPUFF dispersion model was used to predict maximum potential air quality impacts at downwind mandatory Federal PSD Class I areas, and other "sensitive receptors," to: 1) determine if the PSD Class I $NO_2$ increment might be exceeded; 2) calculate potential nitrate and sulfate atmospheric deposition (and their related impacts) in sensitive lakes; and 3) predict potential impacts to visibility (regional haze).

Meteorological information was assembled to characterize atmospheric transport and dispersion from several data sources, including:

- 20 km gridded MM4 (mesoscale model) values with continuous four-dimensional data assimilation,
- hourly surface observations (wind speed, wind direction, temperature, cloud cover, ceiling height, surface pressure, relative humidity, and precipitation),
- twice-daily upper air vertical profiles (wind speed, wind direction, temperature and pressure), and
- PRISM adjusted hourly precipitation measurements.

Potential "reasonable, but conservative" air pollutant emissions from CBM sources were combined with other reasonably foreseeable facilities to determine the total potential cumulative air quality impacts. These other "reasonably foreseeable" facilities included development associated with: 1)

approximately 458 emission sources permitted by the WDEQ/AQD; 2) approximately 34 emission sources permitted by the MDEQ/AWM; and 3) approximately 13 emission sources permitted within the states of North Dakota, South Dakota and Nebraska.

Potential $NO_x$ and $SO_2$ emissions were analyzed to predict potential impacts at 16 PSD Class I areas located in Wyoming, Montana, North and South Dakota (Argonne 2001). Table 4-10 presents the maximum modeled concentration at the specified PSD Class I Area; other PSD Class I areas had lower predicted impacts. All potential direct cumulative $NO_2$ and $SO_2$ impacts would be at or below applicable PSD Class I increments.

It should be noted that this comparison is not a complete PSD Increment Consumption Analysis, but an assessment indicating that the increment would not be exceeded by the cumulative emission sources. Many of the potential air pollutant emission sources were analyzed at their maximum permitted levels; actual emissions and their related air quality impacts are typically less. At the time of a pre-construction air quality permit application, the applicable air quality regulatory agencies may require a much more detailed PSD Increment Consumption Analysis.

Several lakes within four USFS designated wilderness areas were identified as being sensitive to atmospheric deposition and for which the most recent and complete data have been collected. The USFS has also identified the following "Limit of Acceptable Change" regarding potential changes in lake chemistry: no more than a 10 percent change in acid neutralizing capacity (ANC) for those water bodies where the existing ANC is at or above 25 micro equivalents per liter (μeq/l) and no more than a 1 μeq/l change for those extremely sensitive water bodies where the existing ANC is below 25 μeq/l. Based on a Rocky Mountain Region USFS screening method (USFS 2000), Table 4-11 demonstrates that potential impacts to sensitive lakes would be below applicable significance thresholds from the identified emission sources. No sensitive lakes were identified by either the NPS or USFWS.

Table 4-10. Maximum Predicted PSD Class I Area Cumulative Impacts (in $\mu g/m^3$) – Alternative 1 (Proposed Action)

| **Pollutant/Averaging Period** | Class I Area | Maximum Modeled Concentration ($\mu g/m^3$) | Class I Increment ($\mu g/m^3$) |
|---|---|---|---|
| **Nitrogen dioxide - Annual** | Wind Cave NP | 0.5 | 2.5 |
| **Sulfur dioxide - Annual** | Wind Cave | 0.13 | 2 |
| **Sulfur dioxide - 24-hour** | N. Cheyenne Res. | 1.38 | 5 |
| **Sulfur dioxide - 3-hour** | N. Cheyenne Res. | 3.69 | 25 |

Table 4-11. Predicted Total Cumulative Change in ANC at Sensitive Area Lakes (percent change)

| Sensitive Area | Lake | Baseline ANC (μeq/l) | Area (hectares) | Change (percent) | Thresholds (percent) |
|---|---|---|---|---|---|
| **Bridger Wilderness Area** | Black Joe Lake | 69.0 | 890 | 0.8 | 10 |
| | Deep Lake | 61.0 | 205 | 0.9 | 10 |
| | Hobbs Lake | 68.0 | 293 | 0.3 | 10 |
| **Cloud Peak Wilderness Area** | Emerald Lake | 55.3 | 293 | 4.1 | 10 |
| | Florence Lake | 32.7 | 417 | 7.8 | 10 |
| **Fitzpatrick Wilderness Area** | Ross Lake | 61.4 | 4,455 | 0.4 | 10 |

Since the development alternative and cumulative air pollutant emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to impact the mandatory Federal PSD Class I areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 dv) in visibility when compared to background conditions.

A 1.0 dv change is considered a small but noticeable change in haziness as described in the Preamble to the EPA Regional Haze Regulations (64 FR 35725, III.C.). A 1.0 dv change is defined as about a 10 percent change in the extinction coefficient (corresponding to a 2 to 5 percent change in contrast, for a "black target" against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory Federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, such as due to preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change greater than 1.0 dv might be required to be a "just noticeable change."

This NEPA analysis is not designed to predict specific visibility impacts for specific views in specific mandatory Federal PSD Class I areas based on specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on "reasonable, but conservative" emission source assumptions. This approach is consistent with both the nature of regional haze and the

requirements of NEPA. At the time of a pre-construction air quality PSD permit application, the applicable air quality regulatory agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of dv change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as inherent conservatism in the modeling analyses) should all be considered when assessing the significance of predicted impacts.

The USFS, NPS and USFWS have published their "Final FLAG Phase I Report" (*Federal Register*, Vol. 66 No. 2, dated January 3, 2001), providing "a consistent and predictable process for assessing the impacts of new and existing sources of AQRVs" including visibility. For example, the FLAG report states "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "If the visibility impairment from the Proposed Action, in combination with cumulative new source growth, is less than a change in extinction of 10% [1.0 dv] for all time periods, the FLMs will not likely object to the Proposed Action." In addition, the FLAG procedures were also applied using WDEQ/AQD-provided background extinction values.

Although the FLAG procedures were primarily designed to provide analysis guidance to Clean Air Act PSD permit applicants, Table 4-12 uses the "Final FLAG Phase I Report" procedures to summarize the impacts that would be predicted under the PRB Oil and Gas Project Draft EIS Proposed Action, which is the preferred alternative of the BLM, and the No-Action Alternative, which would not authorize additional CBM development on federal oil and gas leases within the project area.

Based on multiple iterations of the non-steady state CALPUFF dispersion modeling system, including the

Table 4-12. Predicted Visibility Impacts in PSD Class I Areas from Cumulative Sources – FLAG Method (Number of Days Predicted to Equal or Exceed a 1.0 dv "Just Noticeable Change")

| Class I Area | Alternative 1[1] Proposed Action | Alternative 3[1] No Action |
|---|---|---|
| **Badlands National Park** | 3 | 2 |
| **Bridger Wilderness Area** | 0 | 0 |
| **Fitzpatrick Wilderness Area** | 0 | 0 |
| **N. Absaroka Wilderness Area** | 1 | 0 |
| **N. Cheyenne Reservation** | 10 | 6 |
| **Washakie Wilderness Area** | 1 | 0 |
| **Wind Cave National Park** | 4 | 2 |

[1] These alternatives pertain to the PRB Oil and Gas Project EIS.

CALMET meteorological model, for five different development alternatives, potential visibility impairment of 1.0 dv or greater ranged from none to ten days. In addition, the air quality impact assessment also analyzed potential visibility (regional haze) impacts at nine PSD Class II areas not subject to the Clean Air Act visibility protection regulations.

If visibility impacts are predicted to equal or exceed 1.0 dv at any PSD Class I area based on the FLAG/WYO analysis, then a daily impact analysis based on monitored optical and relative humidity conditions should be performed.

Since the 1.0 dv threshold was predicted to be reached at Northern Cheyenne Reservation based on the FLAG analysis methodology, the maximum modeled impacts to that area were compared to representative measured optical and relative humidity values on a daily basis. Table 4-13 shows the results of the daily impact analysis under the PRB Oil and Gas Project Draft EIS Proposed Action, which is the preferred alternative of the BLM, and the No-Action Alternative, which would not authorize additional CBM development on federal oil and gas leases within the project area.

When reviewing the predicted cumulative impacts, it is important to understand the "reasonable, but conservative" assumptions made regarding potential resource development. In developing this analysis, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations). The analysis was also based on a reasonably foreseeable development scenario, including several conservative assumptions:

- All emission sources were assumed to operate at their reasonably foreseeable maximum emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the co-probability of such a scenario actually occurring over an entire year (or even 24 hours) is small. While this assumption is typically used in modeling analyses, the resulting predicted impacts will be overstated.

- All proposed natural gas wells were assumed to be fully operational (no dry holes) and remain operating (no shut ins) for about 7 years with an overall 20-year project life.

- The total proposed booster and reciprocating pipeline compression engines (nearly 800,000 hp) were assumed to operate at their rated capacities continuously throughout the LOP (no phased increases or reductions). In reality, compression equipment would be added or removed incrementally as required by the well field operation, compressor engines would

Table 4-13. Predicted Visibility Impacts on the Northern Cheyenne Reservation – Daily Analysis Method (Number of Days Predicted to Equal or Exceed a 1.0 dv "Just Noticeable Change")

| PSD Class I Area | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Alternative 1[1] Proposed Action** | 6 | 6 | 10 | 13 | 8 | 11 | 9 | 14 | 12 | 11 | 14 |
| **Alternative 3[1] No Action** | 4 | 3 | 7 | 9 | 4 | 4 | 6 | 9 | 5 | 6 | 7 |

[1] These alternatives pertain to the PRB Oil and Gas Project EIS.

operate below full horsepower ratings, and it is unlikely all compressor stations would operate at maximum levels simultaneously.

- The atmospheric deposition impact analysis assumed no other ecosystem components would affect lake chemistry for a full year (assuming no chemical buffering due to interaction with vegetation or soil materials).

- The visibility impact analysis assumed seasonal "natural background" optical conditions would occur simultaneously every day throughout each mandatory Federal PSD Class I Area, and that a 1.0 dv "just noticeable change" would be a reasonably foreseeable significant adverse impact, although there is no applicable state, tribal or federal regulatory visibility standards.

Given these numerous "reasonable, but conservative" analysis assumptions, which may actually compound one another, the projected impacts represent an upper estimate of potential air quality impacts which are unlikely to actually be reached. However, even applying these "reasonable, but conservative" analysis assumptions, most predicted impacts are below assumed threshold limits, and scientific evidence is not compelling that reasonably foreseeable significant cumulative adverse impacts would occur.

It is important to note that before actual development could occur, the applicable air quality regulatory agencies (including the state, tribe or EPA) would review specific air pollutant emissions in preconstruction permit applications which examine source-specific air quality impacts. As part of these permits (depending on source size), the air quality regulatory agencies could require additional air quality impact analyses or mitigation measures. Thus, before development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality.

Coal mines develop predictive models to assess the potential air quality impacts of their mining operations. Based on these predictive models conducted for PRB mines, mining operations do not have significant off-site particulate pollution impacts, even when production and pollution from neighboring mines are considered. However, this prediction has been based on the assumptions that mining activities are sufficiently removed from the permit boundaries and that neighboring mines are not actively mining in the immediate vicinity (within 0.6-2.5 miles). Previous modeling (BLM 1992a) has shown that incremental particulate pollution impacts decrease to insignificant levels (< 1 $\mu g/m^3$ $PM_{10}$ annual average) within six miles of active mining.

In cases where mines are in close proximity (within two miles), WDEQ follows a modeling protocol which accounts for all mine-generated

particulate air pollutants from all nearby mines to determine impacts to ambient air quality. Known as the "Mine A/Mine B" modeling procedure, this model evaluates the total impacts of a given mining operation, including those impacts from and on neighboring mines. No other active mines are within two miles of the proposed Ash Creek Mine.

Gaseous clouds produced by overburden blasting are a recent air quality concern related to surface coal mining activities in the PRB. These clouds contain $NO_x$ and exposure to $NO_x$ above certain levels can have human health consequences (see Appendix F). In response to the need for information about the levels of $NO_x$ present in these clouds, a collaborative group of PRB mines under the Air Quality Subcommittee of the WMA collected information on the contents of post-blast gas clouds in the summer of 1999. The report on the August 1999 WMA $NO_x$ monitoring is titled *Powder River Basin - Short-term Exposure $NO_2$ Study*. During that study six monitors were placed at the following mines to obtain a basin-wide data set: Eagle Butte, Wyodak, Belle Ayr/Caballo, Cordero Rojo Complex, Black Thunder, and North Antelope/Rochelle Complex. Roads adjacent to mining activity were selected because they were areas where public exposure would be most likely to occur. A 15-minute average was chosen to be the monitored increment for this study based on similar time intervals used for National Institute for Occupational Safety and Health and OSHA $NO_2$ work place standards. A summary of the data includes the following:

- Approximately 95 percent of the valid data points were readings of 0 ppm $NO_2$.

- The maximum one-minute average valid values observed for each of the six monitors ranged from 0 to 8.0 ppm $NO_2$.

- The maximum 15-minute average valid values observed for each of the six monitors ranged from 0 to 1.65 ppm $NO_2$.

The OSHA Immediately Dangerous to Life and Health threshold for $NO_2$ is 20 ppm (37,600 $\mu g/m^3$) and the EPA Significant Harm threshold is 2 ppm (3,760 $\mu g/m^3$). The report also includes summaries of historic annual and 24-hour monitoring that has been conducted in the PRB and other locations within the region.

The mines in the eastern PRB have also been cooperating in a research and development effort aimed at reducing blasting clouds (Casper Star Tribune, February 3, 2002). This research has led to changes in blasting agents and the size of blasting shots which have reduced $NO_x$ emissions during blasting.

Another air quality concern is the venting of methane that occurs when coal is mined. As discussed in Section 3.4.3, methane (CBM) is generated from coal beds. When coal is mined, by surface or underground methods, the methane that is present

in the coal is vented to the atmosphere. Methane is a greenhouse gas which contributes to global warming. According to the *Methane Emissions* section of Energy Information Administration/ Department of Energy (EIA/DOE) report 0573(99), *Emissions of Greenhouse Gases in the United States 1999*, U.S. anthropogenic methane emissions totaled 28.8 million metric tons in 1999. U.S. 1999 methane emissions from coal mining were estimated at 2.88 million metric tons (10 percent of the U.S. total anthropogenic methane emissions in 1999). According to Table 15 of this report, surface coal mining was estimated to be responsible for about 0.54 million metric tons of methane emissions in 1999. This represents about 1.88 percent of the estimated U.S. anthropogenic methane emissions in 1999, and about 18.75 percent of the estimated methane emissions attributed to coal mining of all types.

Table 7.2 of the EIA/DOE Coal Industry Annual Energy Review for 1999 estimated that 688.3 million short tons of coal were produced by surface mines in the U.S. in 1999. Surface mines in the Wyoming PRB produced approximately 320 million short tons in 1999, or about 46.5 percent of the total production. Using these numbers, it is estimated that the Wyoming PRB coal mines were responsible for approximately 0.9 percent of the estimated U.S. 1999 anthropogenic methane emission.

In many areas, including the PRB, CBM is being recovered from coal and sold. On a large scale, recovery of CBM from the coal prior to mining by both surface and underground methods could potentially gradually reduce U.S. emission of CBM to the atmosphere. In the PRB, CBM is being produced from the coal areas adjacent to and generally downdip of the mines. CBM is currently being produced from the same coal seams that would be mined in the PSO Tract. As discussed in Section 4.4.2, BLM estimates that a large portion of the CBM reserves could be recovered prior to initiation of mining activity on the PSO Tract under the Proposed Action. CBM reserves that are not recovered prior to mining would be vented to the atmosphere.

### 4.8.5 Water Resources

#### Surface Water

Streamflow may be reduced during surface coal mining because SMCRA and Wyoming state regulations require capture and treatment of all runoff from disturbed areas in sedimentation ponds before it is allowed to flow off the mine permit areas. Also, large surface coal mine pits, together with ponds and diversions built to keep water out of the pits, can intercept the runoff from significant drainage areas. Changes in drainage patterns and surface disturbance would decrease flows in most of the ephemeral and intermittent drainages exiting the mine sites. The proposed Ash Creek Mine would be located approximately six miles southwest of the closest active surface coal mining operation, which is the Decker Coal Mine in Big

Horn County, Montana. Due to the distance between these two operations, there would not be many overlapping surface water impacts.

Development of CBM resources in the general area of the mines could potentially increase surface flow in some drainages. CBM development in the general analysis area has been restricted due to concerns about relatively high SAR values in this part of the PRB (Section 4.4.2).

The PRB Oil and Gas Project Draft EIS, which was released for public review in January 2002, includes an evaluation of the surface water impacts that may occur if 50,000 CBM wells are drilled in the PRB in the next ten years. The project area for this EIS covers all of Campbell, Sheridan, and Johnson Counties, as well as the northern portion of Converse County. Under Alternative 1 in the PRB Oil and Gas Project Draft EIS, which is the BLM's preferred alternative, in the Upper Tongue River sub-watershed (page 4-47):

- the representative water quality from the coal has an SAR of 52;
- the additional flow attributable to CBM-produced water would result in very minor contributions to the flow of the Tongue River;
- SAR values in the Tongue River would increase from 0.5 to 1.1;
- the estimated increases in salinity and SAR from CBM discharges in the Tongue River watershed would not alter the irrigation suitability of the Upper Tongue River; and
- CBM discharges in the Upper Tongue River sub-watershed would undergo treatment prior to discharge.

The amount of CBM produced water that ultimately reaches the major channels is reduced by evaporation, infiltration into the ground, and surface landowners, who sometimes divert the produced water into reservoirs for livestock use. These CBM water discharges would be constant, as opposed to naturally occurring flows which fluctuate widely on a seasonal and annual basis.

The CBM discharges could result in erosion and degradation of small drainages, which could affect water quality and channel hydraulic characteristics. From a surface water standpoint, any increased flows due to CBM discharges occurring downstream of surface mining operations would tend to be offset by the reduced flows due to surface coal mining.

The USGS has predicted that after reclamation, cumulative disturbance related to surface coal mining in the eastern PRB will result in increased runoff in major streams (Martin et al. 1988). This is based on the assumption that unit runoff rates would be increased after reclamation due to soil compaction. Other studies also indicate that soil infiltration

rates are lower on reclaimed lands than on pre-mining lands due to changes in drainage patterns and surface disturbance. However, the reduction in slope after reclamation would provide enhanced opportunity for infiltration of precipitation which would tend to offset this temporary decrease in soil infiltration rates.

Drainage from all the surface mines in the general vicinity enters the Tongue River and Tongue River Reservoir. The drainage area of the Tongue River at the State line (USGS Station 06306300) is approximately 1,477 $mi^2$. The entire disturbance area of the proposed Ash Creek Mine (2,595 acres), of which only a portion would be disturbed at any one time, represents about 6.3 percent of the Youngs Creek watershed at its confluence with the Tongue River and less than 0.3 percent of the Tongue River watershed at the State line. The entire area of disturbance from all surface mines within the Tongue River watershed upstream of the Tongue River Reservoir would impact approximately 0.5 percent of the drainage basin to that point.

If the PSO Tract is mined as proposed, sediment concentrations should not increase substantially in the disturbed streams because, as discussed in Section 4.8.5, state and federal regulations require that all surface runoff from mined lands pass through sedimentation ponds. Although reclaimed soils may be more erosive for a few years after reclamation, the larger sediment production would not be delivered to streams due to sediment deposition as a result of flatter slopes on restored lands and sediment trapping by mandated sedimentation ponds.

Groundwater

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If revisions to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If a decision is made to complete the exchange and P&M decides to construct a new surface coal mine, a mining and reclamation permit for the proposed Ash Creek Mine must be approved before the tract can be mined.

A source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ and MDEQ and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations.

Monitoring wells are also required to record water levels and water quality in reclaimed areas. Annual hydrology reports are submitted to the respective regulatory agency by Big Horn Coal Company, Ash Creek Mining Company, Spring Creek Coal Company, and Decker Coal Company.

The major groundwater issues related to surface coal mining are:

- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with backfill material;

- the effects to aquifers used for water supply that are sub-mine disturbance levels;

- changes in water quality as a result of mining; and

- potential overlapping groundwater impacts in the coal due to proximity of coal mining and CBM development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

Assessment of cumulative mining-related groundwater drawdown impacts in this EIS is based on predictions made by the Ash Creek Mining Company that were included in the PSO No. 1 Mine Permit Application No. 407. This information was then extrapolated to consider mining of the PSO Tract. Figure 4-3 depicts the predicted drawdown in the Dietz 1/Dietz 3 coal seam aquifer over the life of the proposed Ash Creek Mine attributed to pit dewatering. The other active mines that are in proximity share an interconnected groundwater system; therefore, the areal extent and magnitude of drawdown resulting from these other operations were investigated to evaluate the cumulative drawdown impacts by all three operations.

As addressed in Sections 3.4.6.1 and 4.4.5, mining-related drawdown in the Dietz 1 and 3 coal seam aquifers would not occur outside of the northeast-trending fault planes that bound the northwest and southeast sides of the PSO Tract. Truncation of the coal seams by the structural faults serves as a barrier to groundwater flow; therefore, potentiometric declines during active mining would be strongly controlled by these faults. Furthermore, the seams that would be mined are not continuous to the southwest, so drawdowns can extend only to the northeast at any appreciable distance from the mine. Drawdown attributed to any other activity must therefore be present within the same fault block and be located northeast of the PSO Tract in order for a cumulative effect to occur.

Due to the discontinuous nature of the coal seams that would be mined in the PSO Tract in the direction of the Big Horn Coal Mine, it is very unlikely that any residual drawdowns created by that mining operation could be additive with drawdowns that would result from mining the PSO Tract. The geographic extent and amount of drawdown associated with mining in the Decker/Spring Creek area is complicated by numerous northeast-trending normal faults that cross the area. The Spring Creek Mine and the proposed Ash Creek Mine do not occur within the same fault block and therefore drawdowns attributed to these two operations would not be additive. The Decker mine and the PSO Tract do occur within the same fault block and therefore share the same coal seam groundwater flow system. No flow models have been developed for the Decker and Spring Creek mines for use in predicting drawdown impacts. Rather, predictions for future drawdowns are based on current trend data and mine plans (MDEQ 1999). Based upon the Cumulative Hydrologic Impact Analysis for the Decker area that was prepared by the MDEQ in 1999, current drawdowns resulting from the Decker Mine do not extent into the PSO Tract area and they are not predicted to during the anticipated mine life.

In Wyoming, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The effects of replacing the coal aquifer and overburden with a backfill aquifer is also a major groundwater concern related to surface coal mining. The following discussion of recharge, movement, and discharge of water in the backfill aquifer for the eastern PRB is excerpted Martin et al. 1988;

> Post-mining recharge, movement and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from pre-mining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

In the eastern PRB, water monitoring data from 1990 to 1999 verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999). Data from backfill monitoring wells at the Big Horn and Decker mines demonstrate that recharge to the backfill occurs readily in the northern PRB as well.

The cumulative size of the backfilled areas in the Tongue River drainage

would be increased by approximately 1,720 acres by mining the proposed Ash Creek Mine. Pre-mining recharge areas (i.e., clinker or scoria outcrops, alluvial valley subcrops) would continue to be the recharge sources for the post-mining backfill aquifer.

The area in which the alluvial aquifers experience a 5-ft drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and are typically unconfined. If P&M develops the Ash Creek Mine as proposed, drawdowns in the alluvial aquifers would be expected to be very local.

If the exchange is completed and P&M elects to construct a new mine, the WDEQ would require more detailed groundwater modeling to predict the extent of drawdown in the coal aquifers caused by mining the PSO Tract. WDEQ/LQD would then use the drawdown predictions to conduct a cumulative hydrologic impact analysis for this portion of the PRB. P&M would be required to install monitoring wells which would be used to confirm or refute drawdowns predicted by modeling. This modeling would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

Potential mining-related water-level decline in the sub-Dietz 3 coal is another groundwater issue. Mine water supply wells used by the Decker Coal Mine are located at least five miles away from the PSO Tract. Due to the distance involved, the possibility of additive drawdowns within a sub-Dietz 3 coal seam aquifer are unlikely. In addition, the zone of completion for the Decker production wells may not be the same as that of the proposed Ash Creek Mine's production well(s).

Another issue of concern with groundwater is the effect of mining on water quality. Specifically, what effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the backfill aquifer following mining?

In a regional study of the cumulative impacts of coal mining in the eastern PRB, the median concentrations of dissolved solids and sulfates were found to be larger in water from backfill aquifers than in water from either the Wasatch overburden or the coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly when the overburden materials were situated above the saturated zone in the pre-mining environment. Using data compiled from ten surface coal mines in the eastern PRB, Martin et al. (1988) also concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. The same conclusions were reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. In general, the mine backfill groundwater TDS can be expected to

range from 3,000 - 6,000 mg/L, similar to the pre-mining Wasatch Formation aquifer, and meet Wyoming Class III standards for use as stock water.

One pore volume of water is the volume of water which would be required to saturate the backfill following reclamation. The time required for one pore volume of water to pass through the backfill aquifer is greater than the time required for the post-mining groundwater system to re-establish equilibrium. According to Martin et al., estimates of the time required to re-establish equilibrium range from tens to hundreds of years.

According to monitoring data, water quality variation in the backfill at the Decker and Spring Creek Coal Mines in the northern PRB is attributable to changes in recharge or discharge associated with mine activity and may vary with the amount and source of recharge. However, as stated within the MDEQ's Cumulative Hydrologic Impact Analysis for the Decker area (1999), TDS concentrations in backfill water would be lowered as upgradient groundwater recharges and flushes the backfill aquifer. The length of time needed for this to occur is unknown; however, the decline in water quality from the backfill aquifers is expected to be a long-term impact but is not anticipated to be permanent. As indicated previously, the cumulative size of the backfilled areas in the Tongue River drainage would be increased by approximately 1,720 acres by mining the proposed Ash Creek Mine. No overlapping impacts to water quality in the backfill would be expected due to the distances between the proposed Ash Creek Mine and the other mines in this area (Decker, Spring Creek, and Big Horn).

The potential for overlapping groundwater impacts from coal and CBM development is also a major groundwater issue in the PRB.

As previously discussed, CBM drilling has occurred on and adjacent to the PSO Tract in Wyoming, although production has been delayed by concerns about discharging the water from the coal on the surface. CBM exploration and limited production was initiated in Montana, in the Decker area, in 1998.

The PRB Oil and Gas Project Draft EIS, which was released for public review in January 2002, includes a modeling analysis of the groundwater impacts that may occur if 50,000 CBM wells are drilled in Campbell, Sheridan, and Johnson Counties and the northern portion of Converse County in the next ten years. That modeling analysis considered existing and proposed CBM production in the area of the proposed Ash Creek Mine area. It does not predict large CBM-related drawdowns in the area of the proposed Ash Creek Mine, which is generally located at the western edge of proposed CBM development in Wyoming.

In Montana, MDEQ's Cumulative Hydrologic Impact Analysis (1999) for the Decker Mine was written prior to CBM dewatering effects and therefore does not account for potential

cumulative drawdown effects. Potentially, drawdown impacts associated with CBM production could exceed the extent and amount of drawdown associated with mining in the Decker area. For example, after a production period of four months (December 1998 through March 1999), 11 CBM wells pumping at an average rate of 17 gpm each created sharp increases in drawdown at Decker Coal Company's monitoring wells located a mile or more south of the West Decker Mine. At least 300 CBM wells are proposed south of the Decker Mine in Montana (MDEQ 1999). This level of CBM development would potentially cause substantial groundwater level declines within all of the producing coal seam aquifers in this general area.

The proposed Ash Creek Mine would be upgradient of this drilling. Based upon existing information, if CBM production increases as proposed, it would be possible that drawdowns in the Dietz 1/Dietz 3 coal seam downgradient of the PSO Tract would lower water levels in the coal seams in the area of the proposed Ash Creek Mine.

As discussed in Section 4.4.5, two groundwater right holders in Montana have been identified as potentially affected by proposed mining operation on the PSO Tract, based on the assumption that both well completion depths are such that they produce water from the Dietz 1/Dietz 3 coal seam. Additional water supply wells completed in the coal seam aquifers in the general analysis area would be expected to experience drawdown as a result of CBM development.

The increased dewatering or depressuring of the coal seam caused by CBM development and mining together would also increase the time required for water-level recovery to occur after the CBM and mining projects are completed. The groundwater impact analysis prepared for the PRB Oil and Gas Project Draft EIS, which considered CBM development and coal mining operations, generally indicates that water levels would recover 75 to 80 percent of pre-operation conditions within 14-16 years following the cessation of CBM operations. This analysis also indicated that the rate of recovery would slow dramatically after this initial recovery period, recovering to within 95 percent of pre-operations conditions over the next hundred years or so.

### 4.8.6 Alluvial Valley Floors

No cumulative impacts to alluvial valley floors are expected to occur as a result of completing the exchange and subsequent mining of the PSO Tract. Impacts to designated AVFs are generally not permitted if the AVF is determined to be significant to agriculture. AVFs that are not significant to agriculture can be disturbed during mining but they must be restored as part of the reclamation process. Impacts during mining, before the AVF is restored, would be expected to be incremental, not additive.

4.8.7 Wetlands

Wetlands are discrete features that are delineated on the basis of specific soil, vegetation, and hydrologic characteristics. Wetlands within areas of coal mining disturbance are impacted; wetlands outside the area of disturbance are generally not affected unless their drainage areas (hence, water supplies) are changed by mining. Therefore, the impacts to wetlands as a result of surface coal mining are mostly incremental, not additive as are impacts to groundwater and air quality. Increasing the area to be mined would increase the number of wetlands that would be impacted.

COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. As part of the mining and reclamation plans for each mine, COE approves the plan to restore the wetlands and the number of acres of wetlands to be restored. Replacement of functional wetlands may occur in accordance with agreements with the surface managing agency (on public land) or by the private landowners. A total of 6.41 acres of federal surface lands are included in the PSO Tract. During mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not function in the same way as the premine wetlands did.

4.8.8 Vegetation

Most of the land that would be disturbed is grassland and sagebrush shrubland which is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the PRB. At the completion of mining, it is anticipated that all disturbed land would be reclaimed for grazing and wildlife habitat, mostly in the form of mixed native grass prairie, sagebrush shrubland and, where appropriate, bottomland grassland. Some of the minor community types, such as those occurring on breaks, would not be restored to pre-mining conditions but may be replaced to a higher level due to use of better quality soils.

Based on annual reports prepared by Spring Creek and Decker Coal mining companies and submitted to MDEQ, in any given year, approximately 1,500 acres of land disturbed by mining activities at these two existing surface coal mines would not be reclaimed to the point of planting with permanent seed mixtures. Over the life of these two mines, a total of about 13,629 acres would be disturbed. This disturbed area includes all leases existing including federal, state and private coal. The proposed Ash Creek Mine would add another 2,595 acres. Almost all of this acreage is native rangeland and would be returned to a native rangeland state through planting of approved revegetation seed mixtures as required. The Big Horn Coal Mine and the Hidden Water Pits were reclaimed to a native rangeland state as well.

Several impacts to vegetation would occur as a result of operations at these three mines. Most of the surface disturbance on the PSO Tract

would occur in one vegetation type: mixed shrub grass prairie (78 percent). The Decker and Spring Creek mines and the Proposed Ash Creek Mine plan to restore the mixed native prairie grass and big sagebrush as required by law. It is estimated that it would take from 20 to 100 years for big sagebrush density to reach pre-mining levels. The big sagebrush component provides important wildlife habitat (particularly for mule deer, pronghorn, and sage grouse). The reduction in acreage of big sagebrush vegetation type would, therefore, reduce the carrying capacity of the reclaimed lands for pronghorn and sage grouse populations until sagebrush density reaches premining levels.

Although some of the less extensive native vegetation types (e.g., graminoid/forb ephemeral drainages) would be restored during reclamation, the treated grazing lands would not. Following reclamation and release of the reclamation bond, however, privately owned surface lands would be returned to private management and the areas with reestablished native vegetation could again be subject to sagebrush management practices.

Community and species diversities would initially be lower on reclaimed lands. The shrub and tree components would take the longest to be restored to pre-mining conditions. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species re-invasion and shrub and tree establishment on reclaimed lands should largely restore the species and community diversity on these lands to pre-mining levels.

Over the long term, the net effect of the cumulative mine reclamation plans may be the restoration, at least in part, of all vegetation types originally found in the area. However, the shrub component may be substantially reduced in areal extent. Shrubs and trees are relatively unproductive for livestock but very important for wildlife. All of the vegetation types found in the cumulative analysis area, as on the PSO Tract, are fairly typical for this region of north-central Wyoming.

Impacts to vegetation related to disturbance from CBM development would be added to the impact of mining. Generally, disturbances related to mining are intense but concentrated in a discrete area, while disturbances related to CBM development are scattered but spread out over a large area.

### 4.8.9 Wildlife

The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. The indirect impacts are longer term and include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse

vegetative cover, and reduction in sagebrush density.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush, ponderosa pine, and Rocky Mountain juniper density, would cause a decrease in carrying capacity and diversity on the PSO Tract. These vegetation types would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent.

Cumulative impacts to most wildlife would increase as additional habitat is disturbed by mining and other activities, including CBM development. These impacts would moderate as land is reclaimed. Raptor and grouse breeding areas have been diminishing statewide for at least the last 30 years due, in part, to surface-disturbing activities. Coal mining and gas exploration and development have been identified as potential contributors to the decline in their breeding habitat. Therefore, surface occupancy and disturbance restrictions, as well as seasonal restriction stipulations, have been applied to operations occurring on or near these crucial areas on public lands. These restrictions have helped protect important raptor and grouse habitat on public lands, but the success of yearlong restrictions on activities near areas critical to grouse has been limited because most of the surface in the PRB is privately owned.

Erection of nesting structures and planting of trees on land reclaimed by surface coal mines would gradually replace raptor nesting and perching sites that are affected by development in areas affected by mining. There is little crucial habitat for waterfowl or fish on the mine sites, so mining would not substantially contribute to impacts to those species. Small- and medium-sized animals would move back into the areas once reclamation is completed.

Numerous grazing management projects (fencing, reservoir development, spring development, well construction, vegetative treatments) have also impacted wildlife habitat in the area. The consequences of these developments have proven beneficial to some species and detrimental to others. Fencing has aided in segregation and distribution of livestock grazing, but sheep-tight woven wire fence has restricted pronghorn movement. Water developments are used by wildlife; however, without proper livestock management, many of these areas can become overgrazed. The developed reservoirs provide waterfowl, fish, and amphibian habitat. Vegetation manipulations have included the removal or reduction of native grass-shrublands and replacement with cultivated crops (mainly alfalfa/grass hay), as well as a general reduction of shrubs (mainly sagebrush) in favor of grass. These changes have increased spring and summer habitat for grazing animals but have also reduced the important shrub component that is critical for winter range, thus reducing overwinter survival for big game and sage grouse. The reduction

in sagebrush has been directly blamed for the downward trend in the sage grouse populations.

The regional EISs which covered the northern PRB (BLM 1981 and 1984) predicted that large-scale surface coal mining could potentially result in significant cumulative impacts to big game due to habitat loss; restrictions in seasonal and daily movement caused by railroads, access roads, and mining operations; poaching; urban development, range overuse; possible lack of water sources; increased road kills; and crop depredation. The WGFD recently concluded that the monitoring had demonstrated a lack of impacts to big game on the existing mine sites which are concentrated in the eastern PRB. No severe mine-caused mortalities have occurred and no long-lasting impacts on big game have been noted on existing mine sites. The WGFD therefore recommended that big game monitoring be discontinued on all existing mine sites in Wyoming. New mines will be required to conduct big game monitoring if located in crucial winter range or in significant migration corridors. No crucial or critical pronghorn habitat has been identified in the area of the PSO Tract, no crucial big game habitat or migration corridors are recognized by the WGFD for this area, and mining operations in this area are not concentrated.

The PSO Tract is within the Clearmont Pronghorn Herd Unit, which includes about 716,800 acres. The Ash Creek Mine would be the only active surface coal mining operation within this herd unit. If the PSO Tract is mined, the total disturbance of 2,595 acres represents approximately 0.4 percent of the Clearmont Herd Unit area.

The PSO Tract is located within the North Big Horn Mule Deer Herd Unit. The herd unit contains approximately 1.64 million acres. The Ash Creek Mine would be the only active surface coal mining operation within this herd unit. If the PSO Tract is mined, the total disturbance of 2,595 acres represent approximately 0.1 percent of the North Big Horn Mule Deer Herd Unit.

The WGFD big game herd unit maps show the PSO Tract is within the 5.5 million acre Powder River White-tailed Deer Herd Unit. If the PSO Tract is mined, the total disturbance would equate to less than 0.05 percent of the herd unit's area.

The area of active mining in the general vicinity of the PSO Tract contains significant numbers of raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country, stream valleys with trees, and upland areas where trees are established. Raptor mitigation plans must be included in the approved mining and reclamation plans of each mine. The raptor mitigation plan for each mine is subject to USFWS review and approval before the mining and reclamation plan is approved. Any nests that are impacted by mining operations must be relocated in accordance with these plans, after

special use permits are secured from USFWS and WGFD. The creation of artificial raptor nest sites and raptor perches may ultimately enhance raptor populations in the mined area. On the other hand, where power poles border roads, perched raptors may continue to be illegally shot and continued road kills of scavenging eagles may occur. Any influx of people into previously undisturbed land may also result in increased disturbance of nesting and fledgling raptors.

Cumulative impacts to waterfowl from already-approved mining, as well as the PSO Tract, would be minor because most of these birds are transient and most of the ponds are ephemeral. In addition, impoundments and reservoirs that are impacted by mining would be restored. Sedimentation ponds and wetland mitigation sites would provide areas for waterfowl during mining. An 86-acre post-mining impoundment was created within Big Horn Coal's reclaimed lands, providing excellent waterfowl habitat that did not exist prior to mining.

Direct habitat disturbance from already-approved mining, as well as the PSO Tract, should not substantially affect regional sage grouse populations because few vital sage grouse wintering areas or leks have been, or are planned to be, disturbed. However, noise related to the mining activity could indirectly impact sage grouse reproductive success. Sage grouse leks close to active mining could be abandoned if mining-related noise elevates the existing ambient noise levels. Surface coal mining activity is known to contribute to a drop in male sage grouse attendance at leks close to active mining, and over time this can alter the distribution of breeding grouse (Remington and Braun 1991). Because sage grouse populations throughout Wyoming have been declining over the past several years, this impact could be significant to the local population when evaluated with the cumulative impacts of all energy-related development occurring in the area.

The existing and proposed mines in the Sheridan Coal Field would cumulatively cause a reduction in habitat for other mammal and bird species. Many of these species are highly mobile, have access to adjacent habitats, and possess a high reproductive potential. Habitat adjacent to existing and proposed mines include sagebrush shrublands, upland grasslands, bottomland grasslands, improved pastures, haylands, wetlands, riparian areas, and ponderosa pine woodlands. As a result, these species should respond quickly and invade suitable reclaimed lands as reclamation proceeds. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas in the eastern PRB was slightly less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992).

Cumulative impacts on fish habitat and populations would be minimal

because local drainages generally have limited value due to intermittent or ephemeral flows. Some of the permanent pools along drainages support minnows and other nongame fish, and the larger impoundments and streams in the area which have fish populations would be restored following mining.

The additional discussions of cumulative impacts to wildlife from coal development and industrialization of the PRB that are discussed in BLM regional EISs covering this area (BLM 1981, 1984) are incorporated by reference into this EIS.

If the exchange is completed and P&M submits a detailed permit application package to WDEQ, the cumulative impacts of mining the PSO Tract will be assessed within the WGFD's and the WDEQ/LQD's review of the mine permit application and the WDEQ/LQD's permit approval process.

### 4.8.10 Threatened, Endangered, and Candidate Plant and Animal Species

Refer to Appendix C.

### 4.8.11 Land Use and Recreation

Surface coal mining reduces livestock grazing and wildlife habitat, limits access to public lands that are included in the mining area, and disrupts oil and gas development. In addition, when oil and gas development facilities are present on coal leases, all associated facilities and equipment must be removed prior to mining. Mining the coal prior to the recovery of all of the CBM resources from the coal bed being mined releases CBM into the atmosphere. The potential impacts of conflicts between CBM and coal development are discussed in Section 4.4.2.

Cumulative land use and recreation impacts resulting from energy extraction in the PRB include a reduction of livestock grazing and subsequent revenues, a reduction in habitat for some species of wildlife (particularly pronghorn, sage grouse and mule deer), and loss of recreational access to public lands (particularly for hunters). Mining the PSO Tract would not affect access to public lands because only 6.41 acres of public lands are included on the tract.

The increased human presence associated with the cumulative energy development in the eastern PRB has likely increased levels of legal and illegal hunting. Conversely, the mines in that area have become refuges for big game animals during hunting seasons since they are often closed to hunting. Reclaimed areas are attractive forage areas for big game. As an example, reclaimed lands at the Jacobs Ranch Mine have been declared crucial elk winter habitat by WGFD (Oedekoven 1994).

Energy development-related indirect impacts to wildlife have and will continue to result from human population growth. Energy development has been the primary

cause of human influx into the PRB. Mining the PSO Tract under the Proposed Action would provide employment for up to 20 years. Development of the PSO Tract and the ensuing employment increase may increase demand for recreational opportunities in Sheridan County.

The demand for outdoor recreational activities, including hunting and fishing, has increased proportionately as population has increased. However, at the same time these demands are increasing, wildlife habitat and populations are being reduced. This conflict between decreased habitat availability and increased recreational demand has had (or may have) several impacts: demand for hunting licenses may increase to the point that a lower success in drawing particular licenses will occur; hunting and fishing, in general, may become less enjoyable due to more limited success and overcrowding; poaching may increase; the increase in people and traffic has and may continue to result in shooting of nongame species and road kills; and increased off-road activities have and will continue to result in disturbance of wildlife during sensitive wintering or reproductive periods.

4.8.12 Cultural Resources

In most cases, treatment of cultural sites that are eligible for the NRHP is confined to those that would be directly impacted by mining, while those that may be indirectly impacted receive little or no consideration unless a direct mine-associated effect can be established. The higher population levels associated with coal development coupled with increased access to remote areas can result in increased vandalism both on and off mine property. Development of lands in which coal is strip-mineable (shallow overburden) may contribute to the permanent unintentional destruction of segments of the archeological record.

A majority of the known cultural resource sites in the PRB are known because of studies at existing and proposed coal mines. Clearly, a number of significant sites, or sites eligible for nomination to the NRHP, have been or will be impacted by coal mining operations within the PRB. Ground disturbance, the major impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigation measures such as stabilization, restoration, or moving of buildings may cause adverse impacts to context, in-place values, and overall integrity. Additionally, loss of sites through mitigation can constitute an adverse impact by eliminating the site from the regional database and/or affecting its future research potential.

Beneficial results or impacts can also occur from coal development. Valuable data are collected during cultural resource surveys. Data that would otherwise not be collected until some time in the future, or lost in the interim, are made available for study. Mitigation also results in the collection and preservation of data that would otherwise be lost. The

data that has been and will be collected provides opportunities for regional and local archeological research projects.

4.8.13 Native American Concerns

If the exchange is completed as proposed and the PSO Tract is mined, no cumulative impacts to Native American traditional values or religious sites have been identified.

4.8.14 Paleontological Resources

Impacts to paleontological resources as a result of the already-approved cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and will result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

4.8.15 Visual Resources

A principal visual impact in this area is the visibility of mine pits and facility areas. People most likely to see these facilities would either be local residents, those passing through the area, or those visiting it on mine-related business. Pits and mine support facilities are generally not visible from more than a few miles away, but coal loading facilities and draglines can be seen from farther away.

After mining, the reclaimed slopes might appear somewhat smoother than pre-mining slopes and there would be fewer gullies, bluffs and rock outcrops than at present. Even so, the landscape of the reclaimed mine would look very much like undisturbed landscape in the area and, in this area, the reclaimed mine areas would be separated by areas where the topography is not disturbed.

4.8.16 Noise

Existing land uses within the PRB (e.g., mining, livestock grazing, oil and gas production, transportation, and recreation) contribute to noise levels, but wind is generally the primary noise source. Mining on the PSO Tract would increase the number of noise-producing facilities within the area and may augment the level of impacts to other resources (e.g., increased exposure of wildlife to noise impact, increased noise impacts to recreational users). Mining-related noise is generally masked by the wind at short distances, so cumulative overlap of noise impacts between mines is not likely.

Recreational users, local residents and grazing lessees utilizing lands surrounding active mining areas do hear mining-related noise; but this has not been reported to cause a substantial impact. As stated above,

wildlife in the immediate vicinity of mining may be adversely affected by noise; however, observations at other surface coal mines in the PRB indicate that wildlife generally adapt to noise conditions associated with active coal mining.

Cumulative increases in noise from trains serving the PRB mines have caused substantial increases (more than five dBA) in noise levels along segments of the rail lines over which the coal is transported to markets. However, no substantial adverse impacts have been reported as a result.

4.8.17 Transportation Facilities

New or enhanced transportation facilities (road, railroads, and pipelines) are expected to occur as a result of energy development in the PRB. However, no new cumulative impacts to transportation facilities are expected to occur as a direct result of the proposed exchange and subsequent mining of the PSO Tract. Excluding the 24,000 ft overland conveyor that would run due south from the mine to the BNSF mainline, the transportation facilities for the Ash Creek Mine are already in place.

4.8.18 Socioeconomics

Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Each of these basic industries is important, and the extractive mineral industry has long been a vital part of Wyoming's economy. Many Wyoming communities depend on the mineral industry for much of their economic well being. The minerals industry is by far the largest single contributor to the economy of Wyoming. The 2000 valuation on minerals produced in 1999 was $4,075,053,784. This was 52 percent of the State's total valuation and placed Wyoming among the top ten mineral producing states in the nation (Wyoming Department of Revenue 2001). Because most minerals are taxed at 100 percent of their assessed valuation, this makes the mineral industry a significant revenue base for both local and state government in Wyoming.

From 1986 through 2000, coal production in Wyoming increased by over 203 percent, an average of 5.2 percent per year. WSGS projects coal production in the state to increase by about four percent per year from 2002 through 2006, with most of the increase occurring in Campbell County. In 1999, Wyoming coal supplied approximately 31 percent of the United States' steam coal needs; PRB coal was used to generate electricity for public consumption in 27 states as well as Canada and Spain (Lyman and Hallberg 1999). Electricity consumers in those states have benefitted from low prices for PRB coal, from cleaner air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal.

Locally, continued sale of PRB coal helps stabilize municipal, county, and

state economies. By 2005, annual coal production is projected to generate about $2.6 billion of total economic activity, including $351 million of personal income, and support the equivalent of nearly 15,885 full-time positions (BLM 1996a).

Although coal mining has historically been an important part of the economy of Sheridan County, this is no longer the case. The 2000 valuation on 1999 production of all minerals in Sheridan County was $1,805,204, or less than 0.04 percent of the state's total (Wyoming Business Council, Minerals, Energy and Transportation Division 2000). With the Big Horn Mine in final stages of reclamation, the only coal mining in the vicinity occurs at the Decker and Spring Creek Mines in Montana. Although most of the employees at these mines live in Sheridan, most of the tax benefits go to Montana.

Mineral production in Sheridan County is projected to decline over the next 5 years (Wyoming Business Council, Minerals, Energy and Transportation Division 2000). The rate of CBM development in Sheridan County has been impacted by the lack of a way to dispose of the produced water. The high SAR of the water makes it unacceptable for irrigation on most soils, prompting WDEQ to cease issuing permits to discharge into the Tongue River Basin (Gary Beach, June 15, 2001).

## 4.9 The Relationship Between Local Short-term Uses of Man*s Environment and the Maintenance and Enhancement of Long-term Productivity

From the fifth year of operations on, the proposed Ash Creek Mine would plan to produce coal at an average production level of 10 million tons per year for 13 years under the Proposed Action (Table 2-1). As the coal in the PSO Tract is mined, almost all components of the present ecological system, which have developed over a long period of time, would be modified. In partial consequence, the reclaimed land would be topographically lower, and although it would resemble original contours, it would lack some of the original diversity of geometric form.

The forage and associated grazing and wildlife habitat that the PSO Tract provides would be temporarily lost during mining and reclamation. During mining of the PSO Tract there would be a combined loss of native vegetation on 2,595 acres (Proposed Action) with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur incrementally over a period of years. The mine site would be returned to equivalent or better forage production capacity for domestic livestock before the performance bond is released. Long-term productivity would depend largely on post-mining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb pronghorn and other big game habitat, but the PSO Tract would be suitable for pronghorn following successful reclamation. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to pre-mining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance. Re-establishment of mature sagebrush habitat--which is crucial for pronghorn and sage grouse--could take even longer.

There are several coal seams which have been identified as potentially economic CBM reservoirs in this area (Dietz 3, Monarch and Carney). P&M proposes to mine the uppermost of those coal beds (Dietz 3) starting about 2008, depending on the coal market. Mining the Dietz 3 seam would allow CBM in that seam to be vented to the atmosphere. Removal of the Dietz 3 coal seam would not directly affect the CBM resources in the lower Monarch and Carney coal seams but would delay CBM recovery from those seams. During that delay, the CBM in those seams could be drained by wells drilled on lands adjacent to the PSO Tract. Several CBM wells have been drilled on the tract and more are proposed. Depending on how the problems associated with water quality and disposal are resolved, it is likely that a substantial portion of the CBM on the PSO Tract could be recovered prior to mining.

Methane is a greenhouse gas which contributes to global warming. According to the *Methane Emissions* section of Energy Information Administration/ Department of Energy (EIA/DOE) report 0573(99), *Emissions of Greenhouse Gases in the United States 1999*, U.S. anthropogenic methane emissions totaled 28.8 million metric tons in 1999. U.S. 1999 methane emissions from coal mining were estimated at 2.88 million metric tons (10.0 percent of the U.S. total anthropogenic methane emissions in 1999). According to Table 15 of this report, surface coal mining was estimated to be responsible for about 0.54 million metric tons of methane emissions in 1999. This represents about 1.88 percent of the estimated U.S. anthropogenic methane emissions in 1999, and about 18.75 percent of the estimated methane emissions attributed to coal mining of all types. Based on the 1999 coal production figure, the eastern PRB coal mines were responsible for approximately 0.9 percent of the estimated U.S. 1999 anthropogenic emission.

Total U.S. methane emissions attributable to coal mining would not likely be reduced if the federal coal is not exchanged and the PSO Tract is not mined at this time because total U.S. coal production would not decrease if this tract is not mined. However, the methane on this tract would potentially be more completely recovered if the exchange is delayed, depending on how fast development of the CBM resource occurs relative to when mining operations begin.

There would be a deterioration of the groundwater quality in the PSO Tract area because of mining; however, the water quality would still be adequate for livestock and wildlife. The deterioration in water quality would probably occur over a long period of time. During mining, depth to groundwater would increase only within about one and one-half miles away from the pits in the Dietz 1/Dietz 3 coal aquifer. The water levels in the coal aquifer should return to pre-mining levels at some time (probably less than 100 years) after mining has ceased.

Mining operations and associated activities would degrade the air quality and visual resources of the area on a short-term basis. Following coal removal, removal of surface facilities, and completion of reclamation, there would be no long-term impact on air quality. The long-term impact on visual resources would be negligible.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance. These changes would primarily impact hunting in this general area. However, P&M does not presently allow hunting on the surface of the PSO Tract. Reclamation would result in a wildlife habitat similar to that which presently exists, so there should be no long-term adverse impacts on recreation.

The Proposed Action would enhance the economy of the region for 20 years.

## 4.10 Irreversible and Irretrievable Commitments of Resources

The major commitment of resources would be the exchange of 107 million tons of federal coal which would be mined and consumed for electrical power generation. CBM that is not recovered prior to mining would also be irreversibly and irretrievably lost (see additional discussion of the impacts of venting CBM to the atmosphere in Section 4.9). It is estimated that 1-2 percent of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 2,595 acres (Proposed Action) would be irreversibly changed. Soil formation processes, although continuing, would be irreversibly altered during mining-related activities. Newly formed soil material would be unlike that in the natural landscape.

Loss of life may conceivably occur due to the mining operation and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming as determined by the Mine Safety and Health Administration (1997) for the 10-year period 1987-1996, fatal accidents (excluding contractors) occur at the rate of 0.003 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 man-hours worked. Any injury or loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown cultural or paleontological values would be irreversible and irretrievable.

# 5.0 CONSULTATION AND COORDINATION

In addition to this EIS, other factors and consultations are considered and play a major role in determining the decision on this proposed exchange. These include the following.

**Regional Coal Team Consultation**. The P&M Exchange Proposal was reviewed and discussed at the February 23, 1999 PRRCT public meeting held on October 27, 1999 in Gillette, Wyoming. P&M presented information about their proposed exchange to the PRRCT at this meeting. The PRRCT recommended that the BLM continue to process the exchange and instructed BLM to proceed with an EIS to evaluate the environmental effects of the exchange.

**Public Notice**. The BLM filed a Notice of Intent to Prepare an EIS and a Notice of Scoping in the *Federal Register* on February 14, 2001. The filing served as notice that the P&M exchange proposal had been received and public comment was requested.

Public scoping meetings were held on March 5, 2001 in La Barge, Wyoming, March 6, 2001 in Rawlins, Wyoming and March 7, 2001 in Sheridan, Wyoming. At the public meetings P&M, BLM and USFS personnel orally presented information about the exchange process and the properties proposed for exchange. The presentations were followed by a question and answer period, during which oral comments were made. The scoping period extended from February 14 through March 31, 2001, during which time BLM received 23 written comments.

The BLM and EPA will each publish a Notice of Availability in the *Federal Register* for the Draft EIS. There will be a 60-day comment period on the Draft EIS. Comments received on the Draft EIS will be included in the Final EIS. After the Final EIS is published, a public meeting or meetings will be held to receive public comments on the public interest factors of the proposed exchange, as required by 43 CFR 2203.3.

**Attorney General Consultation**. After the Final EIS is published and the public meeting or meetings are held, the BLM will forward to the U.S. Attorney General copies of the comments received in response to the request for public comments, the transcript of the public meeting or meetings, and copies of written comments received at the public meeting or meetings.

**Other Consultations**. Other federal, state, and local governmental agencies that were directly consulted in preparation of this EIS are listed in Table 5-1.

**List of Preparers**. Table 5-2 provides a listing of the BLM, USFS, and OSM interdisciplinary team and the third-party consultant personnel who prepared and reviewed this EIS.

**Distribution List**. This EIS was distributed to numerous Congressional offices, federal agencies, state governments, local

governments, industry representatives, interest groups, and individuals for their review and comment (Table 5-3).

Table 5-1. Other Federal, State, and Local Governmental Agencies Consulted in EIS Preparation

| Agency or Organization | Individual | Position |
|---|---|---|
| Powder River Regional Coal Team | 5 Voting Members and 21 Nonvoting Members | Advisory Group |
| Wyoming Game and Fish Department | Lynn Jahnke | Wildlife & Fish Supervisor |
| Wyoming Department of Environmental Quality | | |
| Air Quality Division | Mike Warren | Senior Analyst |
| | Dianna Grant | Senior Analyst |
| | Tina Jenkins | Senior Analyst |
| | Judy Shamley | Senior Analyst |
| Wyoming Oil and Gas Commission | Don Likwartz | Supervisor |
| Wyoming Department of Commerce | Dale Hoffman | Mineral Tax Division Director |
| Wyoming Department of Information and Administration | Wenlin Liu | Division of Economic Analysis, Senior Economist |
| Wyoming Department of Revenue | Dean Ternte | Senior Economist |

Table 5-2. List of Preparers

| Name | Education/Experience | Responsibility |
|---|---|---|
| **BLM/USFS/OSM INTERDISCIPLINARY TEAM** | | |
| **Core Team** | | |
| Nancy Doelger, BLM, Casper Field Office | M.S., B.S. Geology, 25 years professional experience (Licensed Wyoming Geologist) | EIS Project Coordinator |
| Mike Karbs, BLM, Casper Field Office | M.S., Regional Planning and Public Policy, B.S., Mineral Engineering, 27 years professional experience | Document Reviewer |
| Mel Schlagel, BLM, Wyoming State Office | M.S., Agricultural Economics, 34 years professional experience | Exchange Coordinator and Document Reviewer |
| Tamara Gertsch, BLM, Wyoming State Office | M.P.A, Public Administration B.S. Business/Marketing 20 years experience | Document Reviewer |
| Mark Booth, USFS, Kemmerer Ranger District | B.S. Range Management 16 years experience | Forest Service Coordinator and Reviewer |
| Floyd McMullen, OSM, Western Regional Coordinating Center | M.S., Environmental Science, B.S., Range/Forest Management, 28 years professional experience | Project Coordinator |
| **Support Team** | | |
| B.J. Earle, BLM, Buffalo Field Office | B.A., Archaeology, 24 years professional experience | Cultural Resources Reviewer |
| Larry Gerard, BLM, Buffalo Field Office | B.S., Wildlife Management, 26 years professional experience | Wildlife Resources Reviewer |
| John Kolnik, BLM, Buffalo Field Office | B.S., Range Management, 28 years professional experience | Buffalo Coordinator |
| Tom Bills, BLM, Buffalo Field Office | B.S. Forest Biology (Wildlife) 15 years experience | Wildlife Resources Reviewer |
| Larry Jackson, BLM, Rawlins Field Office | B. S. Range Management 27 years experience | Rawlins Coordinator |
| Frank Blomquist, BLM, Rawlins Field Office | B.S., Wildlife Biology, B.S. Botany, B.A., Natural Resources, 20 years professional experience | Wildlife Vegetation Resources Reviewer |
| Alberta Settle, BLM, Rawlins Field Office | B.A., Geology, M.S., Geology, M.S., Civil and Environmental Engineering, 15 years professional experience | Hazardous Materials Assessment |
| Andy Warren, BLM, Rawlins Field Office | B.S., Range Management and Wildlife Biology, 22 years professional experience | Vegetation and Rangeland Reviewer |
| Bill Wadsworth, BLM, Pinedale Field Office | B.S. Biology 15 years experience | Pinedale Coordinator |

Table 5-2. List of Preparers (continued)

| Name | Education/Experience | Responsibility |
|---|---|---|
| **WESTERN WATER CONSULTANTS, INC.** | | |
| Doyl Fritz | M.S., B.S. Civil Engineering, 30 years professional experience (Licensed Professional Engineer) | Report Preparation |
| Ken Collier | B.S. Geology, 23 years professional experience (Licensed Wyoming Geologist) | Project Management, Report Preparation |
| Mal McGill | 1 year professional experience | CADD |
| Rodney Ventling | 10 years professional experience | CADD |
| Heidi Robinson | 9 years professional experience | Document Production |
| Beth Parrill | B.S. Horticulture, 1 year professional experience | Document Production |
| **INTERMOUNTAIN RESOURCES** | | |
| Jim Orpet | M.S. Range Management, B.S. Wildlife Management, 21 years professional experience | Physical Resources |
| Bill Glenn | B.S. Agronomy, 33 years professional experience | Soil Baseline |
| Russell Tait | B.S. Wildlife Management, 6 years professional experience | Wildlife Baseline |
| **GCM SERVICES, INC.** | | |
| David Ferguson | M.A. Anthropology, 13 years experience | Cultural Resources |
| Garren Meyer | B.A. Anthropology, 9 years experience | Cultural Resources |
| **McVEHIL-MONNETT ASSOCIATES** | | |
| William R. Monnett | B.S. Meteorology, 23 years professional experience | Air Quality |
| George E. McVehil | Ph.D. CCM, B.S., M.S., Ph.D. Meteorology, 40 years professional experience | Air Quality |

Table 5-3. Distribution List - Draft EIS

| | | |
|---|---|---|
| **Powder River Regional Coal Team Voting Members** | | |
| Honorable Judy Martz<br>Governor of Montana | Honorable Jim Geringer<br>Governor of Wyoming | Al Pierson<br>BLM Wyoming State Director |
| Matt Millenbach<br>BLM Montana State Director | Alan Rabinoff<br>BLM Deputy State Director<br>Minerals and Land | |
| **Powder River Regional Coal Team Non-Voting and Alternate Voting Members** | | |
| Big Horn County Planning Board, Montana | BLM Wyoming State Office | BLM Montana State Office |
| BLM Washington Office | Bureau of Indian Affairs<br>Billings, Montana | Crow Tribal Council |
| Gillette Department of Community Development | Montana Office of the Governor | National Park Service, Devils Tower National Monument |
| National Park Service, Fossil Butte National Monument | Northern Cheyenne Tribal Council | Office of Surface Mining Reclamation & Enforcement, Denver, CO |
| Powder River County, Montana | Rocky Mountain Regional Solicitor's Office<br>Denver, CO | Rosebud County, Montana |
| US Forest Service, Medicine Bow<br>National Forest<br>Laramie, WY | US Forest Service, Douglas Ranger District<br>Douglas, WY | US Fish & Wildlife Service<br>Cheyenne, WY |
| US Geological Survey<br>Denver, CO | | |
| **Congressional Offices** | | |
| US Congresswoman Barbara Cubin<br>Casper, WY<br>Rock Springs, WY | US Congressman James Hanse<br>Ogden, UT | US Senator Mike Enzi<br>Casper, WY<br>Gillette, WY<br>Jackson, WY |
| US Senator Craig Thomas<br>Casper, WY<br>Sheridan, WY<br>Rock Springs, WY | | |
| **Federal Agencies** | | |
| BLM<br>Washington, D.C.<br>Rawlins, WY<br>Pinedale, WY<br>Buffalo, WY<br>Miles City, MT<br>Casper, WY<br>Kemmerer, WY | Bureau of Indian Affairs<br>Washington, D.C. | Bureau of Reclamation<br>Denver, CO<br>Washington, D.C. |
| Environmental Protection Agency<br>Denver, CO<br>Washington, D.C. | Federal Highway Administration<br>Washington, D.C. | HQ-US Air Force<br>Washington D.C. |

Table 5-3. Distribution List - Draft EIS (continued)

| | | |
|---|---|---|
| Minerals Management Service<br>Herndon, VA<br>Denver, CO | National Park Service<br>Lakewood, CO<br>Washington, D.C. | Office of Environmental Policy<br>Washington, D.C. |
| Office of Surface Mining Reclamation and Enforcement<br>Casper, WY<br>Washington, D.C. | US Army Corps of Engineers<br>Omaha, NE<br>Cheyenne, WY | US Forest Service<br>Lakewood, CO<br>Kemmerer, WY<br>Washington, D.C. |
| US Department of Energy<br>Casper, WY | US Department of the Interior<br>Denver, CO | US Geological Survey<br>Cheyenne, WY |
| US Fish & Wildlife Service<br>Helena, MT<br>Washington, D. C. | | |
| **State Government** | | |
| Rep. Jack Landon<br>Sheridan, WY | Rep. Bruce Burns<br>Sheridan, WY | Rep. Jerry Iekel<br>Sheridan, WY |
| Rep. Douglas Osborn<br>Buffalo, WY | Rep. Louie Tomassi<br>Big Piney, WY | Rep. Kenilynn Zanetti<br>Rock Springs, WY |
| Senator Tom Kinnison<br>Sheridan, WY | Senator John Schiffer<br>Kaycee, WY | |
| **State Agencies** | | |
| Montana Department of Environmental Quality | Wyoming Water Development Commission<br>Cheyenne, WY | Wyoming State Engineer's Office<br>Cheyenne, WY |
| Wyoming State Historic Preservation Office<br>Cheyenne, WY | Wyoming Oil & Gas Conservation Commission<br>Casper, WY | Wyoming State Geological Survey<br>Laramie, WY |
| Wyoming Industrial Siting Division<br>Cheyenne, WY | Wyoming Snowmobile Program Manager | Wyoming State Inspector of Mines<br>Rock Springs, WY |
| Wyoming Parks & Cultural Resources Department<br>Cheyenne, WY | Wyoming Public Service Commission<br>Cheyenne, WY | Wyoming Department of Environmental Quality<br>Cheyenne, WY<br>Sheridan, WY |
| Wyoming Division of Economic Analysis<br>Cheyenne, WY | Wyoming Department of Transportation<br>Cheyenne, WY | Wyoming Department of Agriculture<br>Cheyenne, WY |
| Wyoming Department of Employment<br>Research and Planning<br>Casper, WY | Wyoming Game and Fish Department<br>Cheyenne, WY<br>Sheridan, WY<br>Kemmerer, WY<br>Cokeville, WY<br>Green River, WY<br>Pinedale, WY | Wyoming State Clearinghouse<br>Cheyenne, Wyoming |
| Wyoming Business Council<br>Cheyenne, WY | Wyoming Office of Federal Land Policy<br>Cheyenne, WY | |

Table 5-3. Distribution List - Draft EIS (continued)

| | | |
|---|---|---|
| **City and County Governments** | | |
| Sheridan County Commission | Lincoln County Commission | Carbon County Commission |
| Sublette County Commission | Fremont County Commission | Sweetwater County Commission |
| Mayor of Sheridan | Mayor of Cokeville | Mayor of Diamondville |
| Mayor of Evanston | Mayor of Kemmerer | Mayor of La Barge |
| Lincoln County Planner | | |
| **Indian Tribes and Tribal Governments** | | |
| Cheyenne River Sioux Tribe | Clifford Long Sioux | Crow Creek Sioux Tribal Council |
| Crow Tribal Administration Cultural Director | Eastern Shoshone Business Council | Eastern Shoshone Spiritual Leader Delphine Clair |
| Eastern Shoshone Spiritual Leader Haman Wise | Eastern Shoshone Tribal Attorney | Flandreau Santee Sioux Executive Committee |
| Lower Brule Sioux Tribe | Northern Arapaho Spiritual Leader Bobby Joe Goggles | Northern Arapaho Business Council |
| Northern Cheyenne Cultural Committee | Northern Cheyenne Traditional Spokesperson Steven Brady | Northern Cheyenne Tribal Council |
| Oglala Sioux Tribal Council | Oglala Sioux Tribal Administration | Rosebud Sioux Tribe |
| Santee Sioux Tribal Council | Southern Cheyenne/ Southern Arapaho Tribal Offices | Standing Rock Sioux Agency |
| William C'Hair | | |
| **Industry and Business** | | |
| American Colloid Company | Antelope Coal Company | Ark Land Company |
| Belle Ayr Mine | Big Horn Coal Company | Bridgeview Coal Company |
| Buckskin Mine | Burlington Northern Railroad Company | Burns & McDonnell |
| C.H. Snyder Company | CE&MT, Inc. | CH2M Hill |
| Consol, Inc. | Cordero-Rojo Mine Complex | Davis & Cannon |
| Decker Coal Company | Diamond H Ranch | Dry Fork Coal Company |
| Ducker, Montgomery, Lewis, & Aronstein, P.C. | Duke Energy | Eagle Butte Mine |
| ECC | El Paso Production Company | ENCOAL |
| Environmental Solutions | Evergreen Enterprises | Exxon Company USA |
| Farleigh Oil Properties | Flying E Ranch | Foster-Wheeler Environmental |
| Glenrock Coal Company | Greystone | Hardin & Associates |
| Herscher Ranch | Independent Production Company | Institute for Policy Research, Northwestern University |

Table 5-3. Distribution List - Draft EIS (continued)

| | | |
|---|---|---|
| Intermountain Resources | International Alcoholic Treatment | Irox Ranch |
| J.M. Huber Corporation | Jacobs Ranch Coal Corporation | Kennecott Energy Company |
| Kenneth R. Paulsen Cons. | Kfx Wyoming Inc. | Kiewit Mining Company |
| KN Energy | L.E. Peabody & Associates | Louisiana Pacific Corporation |
| M & K Oil Company, Inc. | Marston & Marston | McCarty Canyon Ranch |
| McGraw-Hill | McVehil-Monnett Associates, Inc. | Meineadair Consultants |
| Mine Engineers, Inc. | Mining Associates of Wyoming | Nerco Coal Company |
| North Rochelle Mine | Norwest Mine Services | P&M Coal Company |
| Pacificorp | Pacificorp/Interwest Mng. | Padlock Ranch Company |
| PIC Technologies | Poudre Environmental Consultants | Powder River Eagle Studies Inc. |
| Powder River Energy Corporation | Powder River Coal Company | RAG Coal West Inc. |
| Range Telephone Coop. | Redstone Resources | Reserve Coal Properties |
| Riverside Technology, Inc. | Royal Gold, Inc. | San Juan Coal Company |
| Shea & Gardner | Shell Mining Company | Stone & Wolf, LLC |
| The Rim Companies | Thompson Logging | Three Forks Ranch |
| Thunder Basin Coal Company | Torch Energy | TRC Mariah Associates |
| Triton Coal Company | URS Greiner Woodward Clyde | US West Communications, Inc. |
| Utah Power & Light Property Service | V Cross Cattle Company | Wal-Mart |
| Western Energy Company | Western Fuels Association | Western Gas Resources |
| WWC Engineering | Wyodak Resources Development Corp. | Yates Petroleum Company |
| **Interest Groups and Professional Societies** | | |
| Advisory Council on Historic Preservation | Alliance for the Wild Rockies | American Wildlands |
| Big Horn Audubon Society | Cheyenne High Plains Audubon Society | Foundation for North American Wild Sheep |
| Friends of the Bow /Biodiversity Associates | Grass Roots Advocate | Greater Yellowstone Coalition |
| Izaak Walton League of America | La Barge Area Public Land Users | Lincoln-Uinta Association of Gov. |
| Medicine Wheel Alliance | Murie Audubon Society | National Mining Association |
| People for the West | People for Wyoming | Petroleum Association of Wyoming |

Table 5-3. Distribution List - Draft EIS (continued)

| | | |
|---|---|---|
| Pheasants Forever | Powder River Basin Resource Council | Sheridan Chamber of Commerce |
| Sierra Club | The Fund for Animals | The Nature Conservancy Public Lands Project |
| Trout Unlimited | Wildlife Management Institute | Wind River Multiple Use Advocates |
| Wyoming Association of Professional Archeologists | Wyoming Geological Association | Wyoming Heritage Society |
| Wyoming Mining Association | Wyoming Outdoor Council | Wyoming Public Lands Council |
| Wyoming Stock Growers Association | Wyoming Wildlife Federation | Wyoming Wool Growers Association |
| **Media** | | |
| Associated Press | Casper Journal | Casper Star-Tribune |
| Cheyenne-Wyoming Eagle | Coal Daily | Douglas Budget |
| Gillette News Record | Rocky Mountain Oil Journal | Western Coal Newsletter |
| Sheridan Press | Rawlins Daily Times | Kemmerer Gazette |
| Rock Springs Rocket Miner | KSGT Radio | |
| **Libraries** | | |
| Colorado State University Libraries | Department Of the Interior Natural Resources Library | University of Wyoming Libraries |
| **Individuals** | | |
| Todd Anderson | Helen Anelli | George Baker |
| Ralph Barbero | Calvin Barnes | Scott Benson |
| Jeff Bertot | Sheldon Bierman | Eugene Call |
| Craig Chadwick | Don & Elinor Crecelius | Robert Crooks |
| Cecil Cundy | Arnold Cunningham | Shelly Damon |
| Jerry Daub | Sharon Dayton | Neil Delapp |
| Steve Desormeaux | Mark Domek | Clint Erickson |
| David Eugster | Leo Hakola | Pam Hamilton |
| Jerry Hansen | Ted Harmon | Lillian Harrower |
| Lee Helvey | Michael Helvey | Steve Hoffman |
| Jim & Lynn Howe | Mike Hunzie | Gerald Jacob |
| Bruce Jones | Brian Kennedy | William Krall |
| Frank Lentz | Clayton Lunde | Louis Madrid Trust |
| Dean McClure | Frank & Mary Mommsen | Celia Myres |
| F.L. Natta | Ray Okelberry | Ted Olson |
| Ed Patterson | Anthony Poeschl | Lori Roberts |

Table 5-3. Distribution List - Draft EIS (continued)

| | | |
|---|---|---|
| C.J. Robertson | Gene Robinson | Bill Saulcy |
| Lloyd Schreibeis | Norman Schreibeis | Lonnie Smith |
| Bill Thek | Blaine Thoman | Thomas Thrash |
| Norris Tratnik | Ray & Pam Tucker | Ralph Urbigheit |
| Jim Vilos | J. Michael Watkins | John Williams |
| Mark Winland | Clyde Wolfley | |

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# 7.0 GLOSSARY

**ad valorem tax** - A tax paid as a percentage of the assessed value of property.

**adverse impact** -An apparent direct or indirect detrimental effect.

**alkalinity -** The degree to which the pH of a substance is greater than 7.

**alluvial deposit** - Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

**alluvial valley floors** (AVFs) - An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

**alluvium** - Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its flood plain or delta.

**alternative** - In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

**ambient** -Surrounding conditions (or environment) in a given place and time.

**annual precipitation** - The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

**approximate original contour** - Post-mining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

**aquifer** - A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use.

**arithmetic mean** - The sum of the values of n numbers divided by n. It is usually referred to as simply the “mean” or “average”.

**ash -** The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

**backfill** - The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

**baseline** - Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

**beneficial impact** - An apparent direct or indirect advantageous effect.

**bentonite** - A clay formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

**bonus** - That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals [see 43 CFR 3400.0-5(c)].

**buffer zone** - An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

**CALMET** - the meteorological module that is associated with the CALPUFF model

**CALPUFF** - a long-range transport Gaussian puff air model

**clinker (scoria)** - Baked and fused rock resulting from in-place burning of coal deposits.

**coal bed methane** - Methane gas that is generated during the coal-forming process.

**colluvium** - Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

**confluence** - The point at which two or more streams meet.

**contiguous** - Lands or legal subdivisions having a common boundary, lands having only a common corner are not contiguous.

**cooperating agency** - An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document [see 40 CFR 1501.6 and 1508.5].

**crucial wildlife habitat -** Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

**cultural resources** - The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

**cumulative impact** - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

**decibel** - A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

**deciview** - A measure of view impairment (13 deciview equals a view of approximately 60 miles).

**dip** - The angle at which a rock layer is inclined from the horizontal.

**direct (or primary) impact** - An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

**discharge** - Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

**dissected upland** - An upland or high area in which a large part of the original surface has been deeply cut into by streams.

**dragline** - A type of excavating crane that casts a rope- or cable-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material on a backfill bank or pile.

**eolian deposit** - Sediment carried, formed, or deposited by the wind, as sand dunes.

**ephemeral stream** - A stream that flows occasionally because of surface runoff, and is not influenced by permanent ground water.

**erosion** - The wearing away of the land surface by running water, wind, ice or other geologic agents.

**evapotranspiration** - The sum total of water lost from the land by evaporation and plant transpiration.

**excavation (archeological)** - The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

**fair market value** - The amount in cash, or in terms reasonably equivalent to cash, for which in all probability a coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

**fixed carbon** - In coal, the solid combustible material remaining after removal of moisture, ash, and volatile matter. It is expressed as a percentage.

**floodplain** -The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream, that is covered with water when the river or stream overflows its banks.

**forage** - Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

**formation (geologic)** - A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

**fossil** - The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin are not considered to be fossils (e.g. oil, gas, asphalt, limestone).

**geometric mean** - The nth root of the product of the values of n positive numbers.

**groundwater** - Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

**habitat** - A place where a plant or animal naturally or normally lives and grows.

**habituation** - The process of becoming accustomed to, or used to, something; acclimation.

**hazardous materials** - Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons or damage to property.

**hazardous waste -** Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR § 261.

**human environment** - The natural and physical environment and the relationship of people with that environment (see 30 CFR 1508.14).

**hydraulic conductivity** - The capacity of a medium to transmit water; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

**hydraulic** - Pertaining to fluid in motion, or to movement or action caused by water.

**hydric soil** - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

**hydrocarbon** - Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

**hydrogeology** - The science that deals with subsurface waters and with related geologic aspects of surface waters.

**hydrology -** The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

**hydrophytic vegetation** - The plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

**impermeable** - Not capable of transmitting fluids or gasses in appreciable quantities.

**indirect (or secondary) impact** - A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

**in-place coal reserves** - The estimated volume of all of the coal reserves in a lease without considering economic or technological factors which might restrict mining.

**in-situ leach mining** - Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock.

**interbedded** - Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

**interburden** -A layer of sedimentary rock that separates two mineable coal beds.

**interdisciplinary -** Characterized by participation or cooperation among two or more disciplines or fields of study.

**intermittent stream** - A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

**land and resource management plan** - A land use plan that directs the use and allocation of U.S. Forest Service lands and resources.

**lead agency** - The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

**lease (mineral)** - A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained [see 43 CFR 3400.0-5(r)].

**lek** - A traditional breeding area for grouse species where territorial males display and establish dominance.

**lenticular** - Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

**limb (geologic)** - One side of a fold (syncline or anticline).

**lineament** - A linear topographic feature of regional extent that is believed to reflect crustal structure.

**loadout facilities** - The mine facilities used to load the mined coal for transport out of the mine.

**loam** - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

**maintenance tract** - A federal coal tract that would continue or extend the life of an existing coal mine.

**major federal action** - An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

**meteorological** -Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

**methane** - A colorless, odorless, and inflammable gas; the simplest hydrocarbon; chemical formula = $CH_4$. It is the principal constituent of natural gas and is also found associated with crude oil and coal.

**mineable coal** - Coal that can be economically mined using present day mining technology.

**mineral rights** - The rights of one who owns the mineral estate (subsurface).

**mining permit** - A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

**mitigation** - An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

**National Register of Historic Places (NRHP**) - A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

**natural gas** - Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) which are in a gaseous phase at atmospheric conditions of temperature and pressure.

**NEPA process** - All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

**no-action alternative** - An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The no action alternative provides a baseline for estimating the effects of other alternatives.

**outcrop** -A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

**overburden** - Material of any nature, consolidated or unconsolidated, that overlies a coal or other useful mineral deposit, excluding topsoil.

**paleontological resource** - A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

**peak discharge or flow** - The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

**perennial species (vegetation)** - Vegetation that lives over from season to season.

**perennial stream** - A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

**permeability** - The ability of rock or soil to transmit a fluid.

**permit application package** - A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

**permit area** - The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

**physiography** - Physical geography.

**playa** - The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

**point source (pollution)** - A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

**pore volume** - the amount of fluid necessary to fill the void space in an unsaturated porous medium (i.e., mine backfill).

**postmining topography** - The relief and contour of the land that remains after mining has been completed.

**potentiometric surface** - The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydrologic head.

**predator** - An animal that obtains food by killing and consuming other animals.

**prime or unique farmland** - Those lands which are defined by the Secretary of Agriculture in 7 CFR part 657 (*Federal Register* Vol. 4 No. 21) and which have historically been used for cropland (see 30 CFR 701.5).

**proposed action** - In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

**raptor** - Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

**recharge** - The processes by which groundwater is absorbed into a zone of saturation.

**reclamation** - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore the disturbed area for post-mining use.

**record of decision (ROD)** - A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

**recoverable coal**- The amount of coal that can actually be recovered for sale from the demonstrated coal reserve base.

**resource management plan** - A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

**revegetation** - The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

**riparian** - The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

**royalty (mineral)** - A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

**runoff** - That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

**salinity** - Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non saltwater areas, total dissolved solids is used as an equivalent term.

**sandstone** - A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

**scoping** - A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

**scoria (clinker)** - Baked and fused rock resulting from in-place burning of coal deposits.

**sedimentation pond** - An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

**severance tax** - A tax on the removal of minerals from the ground.

**shale** - A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

**significant impact** - A qualitative term used to describe the anticipated importance of impacts to the human environment as a result of an action.

**siltstone** - A fine-grained clastic rock consisting predominately of silt-sized particles.

**socioeconomics** - The social and economic situation that might be affected by a proposed action.

**sodium adsorption ratio (SAR)** - The ratio of the concentration of sodium cations to the combined concentration of calcium and magnesium cations in water. High values of SAR are indicative of potential problems in agricultural applications, as it implies a hazard of sodium replacing adsorbed calcium and magnesium, and this replacement is damaging to soil structure.

**soil survey -** The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

**spontaneous combustion** - The heating and slow combustion of coal and coaly material initiated by the absorption of oxygen.

**stipulations** - Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

**storage coefficient** - The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

**stratigraphic** - Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

**subirrigation** - In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

**subbituminous** -A lower rank of coal (35-45% carbon) with a heating value between that of bituminous and lignite, usually 8,300-11,500 Btu per pound. Subbituminous coal contains a high percentage of volatile matter and moisture.

**surface disturbance** - Any disturbance by mechanical actions which alters the soil surface.

**suspended solids** - The very fine soil particles which remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

**tectonic fracture** - Fractures caused by deformation of the earth's crust.

**threatened and endangered (T&E) species -** These species of plants or animals classified as threatened or endangered pursuant to section 4 of the Endangered Species Act. Any species which is in danger of extinction, or is likely to become so within the foreseeable future.

> ***Category 1*** - Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.

***Category 2*** - Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (U.S. Fish and Wildlife Service).

**topography -** Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

**topsoil** - The surface layer of a soil.

**total dissolved solids (TDS)** - The total quantity in milligrams per liter of dissolved materials in water.

**transmissivity** - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

**truck and shovel** - A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

**unconfined aquifer** - an aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

**unsuitability criteria** - The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

**vegetation type** - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

**vertebrate fossils** - The remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

**visual resources** - The physical features of a landscape which can be seen (e.g., land, water, vegetation, structures, and other features).

**Visual Resource Management (VRM**) - The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

**volatile matter** - In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

**waterfowl** - A bird that frequents water, especially a swimming bird.

**wetlands** - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs [see 33 CFR 328.3(a)(7)(b)].

**wilderness** - An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

# APPENDIX A

FEDERAL AND STATE PERMITTING
REQUIREMENTS AND AGENCIES

# APPENDIX A: FEDERAL AND STATE AGENCIES & PERMITTING REQUIREMENTS

| Agency | Lease/Permit/Action |
|---|---|
| **FEDERAL** | |
| Bureau of Land Management | Coal Lease and/or Exchange<br>Resource Recovery & Protection Plan<br>Scoria Sales Contract<br>Exploration Drilling Permit |
| Mine Safety and Health Administration | Safety Permit and Legal ID<br>Ground Control Plan<br>Major Impoundments<br>Explosives Use and Storage Permit |
| Bureau of Alcohol, Tobacco, and Firearms | Explosives Manufacturer's License<br>Explosives Use and Storage Permit |
| Federal Communication Commission | Radio Permit: Ambulance<br>Mobile Relay System Radio License |
| Nuclear Regulatory Commission | Radioactive By-Products Material License |
| Army Corps of Engineers | Authorization of Impacts to Wetlands and Other Waters of the U.S. |
| Department of Transportation | Hazardous Waste Shipment Notification |
| Federal Aviation Administration | Radio Tower Permits |
| **STATE** | |
| Department of Environmental Quality-Land Quality Division | Permit and License to Mine<br>Reclamation Performance Bond |
| Department of Environmental Quality-Air Quality Division | Air Quality Permit to Construct<br>Air Quality Permit to Operate |
| Department of Environmental Quality-Water Quality Division | National Pollutant Discharge Elimination System Water Discharge Permit<br>Permit to Construct Sedimentation Pond<br>Authorization to Construct Septic Tank & Leach Field<br>Authorization to Construct and Install a Public Water Supply and Sewage Treatment System |
| Department of Environmental Quality-Solid Waste Management Program | Solid Waste Disposal Permit-Permanent and Construction |
| State Engineer's Office | Appropriation of Surface Water Permits<br>Appropriation of Ground Water Permits |
| Industrial Siting Council | Industrial Siting Certificate of Non-Jurisdiction |
| Department of Health | Radioactive Material Certificate of Registration |

# APPENDIX B

UNSUITABILITY CRITERIA FOR
THE PSO TRACT

# Appendix B. Unsuitability Criteria for the PSO Tract

| UNSUITABILITY CRITERIA | GENERAL FINDINGS FROM APPROVED RMP FOR PUBLIC LANDS ADMINISTERED BY BLM BUFFALO FIELD OFFICE (BLM 2001) | VALIDATION FOR PSO TRACT |
|---|---|---|
| 1. Federal Land Systems. With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands Acquired through the Land and Water Conservation Fund, National Forests and federal lands in incorporated cities, towns and villages. | None of the listed federal lands categories are present within the study area. | None of the listed federal lands are present on the PSO Tract, and the tract therefore is not unsuitable for mining. |
| 2. Rights-Of-Way and Easements. Federal lands that are within rights-of-way or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining. | The federal lands in the study area contain no rights-of-way that meet the intent of this criterion. | No rights-of-way or easements are on the federal lands on the PSO tract, and the tract therefore is not unsuitable for mining. |
| 3. Dwellings, Roads, Cemeteries, and Public Buildings. Federal lands within 100 feet of a right-of-way of a public road or a cemetery; or within 300 feet of any public building, school, church, community or institutional building or public park; or within 300 feet of an occupied dwelling are unsuitable for mining. | No federal lands in the study area meet the intent of this criterion. | None of the listed rights-of-way or buildings are on the PSO Tract, and the tract therefore is not unsuitable for mining. |
| 4. Wilderness Study Areas. Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation. | No lands in the general review area are within a wilderness study area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 5. Lands with Outstanding Scenic Quality. Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable. | No lands in Sheridan County meet the scenic criteria as outlined. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study. | No lands in the general review area are under permit except small enclosures being used to gage reclamation success on existing mines. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 7. Historic Lands and Sites. All publicly or privately owned places which are included in or are eligible for inclusion in the National Register of Historic Places and an appropriate buffer zone are unsuitable. | On the basis of the consultation with the State Historic Preservation Office, there were no unsuitable findings under this criterion in the general review area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable. | No lands in the general review area are designated as natural areas or as National Natural Landmarks. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for T or E plant and animal species, and scientifically documented essential habitat for T or E species are unsuitable. | There is no habitat meeting federally designated criteria for T or E plant or animal species within the general review area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 10. State Listed Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as T or E shall be considered unsuitable. | Wyoming does not maintain a state list of T or E species of plants or animals. Therefore, this criterion does not apply. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |

| UNSUITABILITY CRITERIA | GENERAL FINDINGS FROM APPROVED RMP FOR PUBLIC LANDS ADMINISTERED BY BLM BUFFALO FIELD OFFICE (BLM 2001) | VALIDATION FOR PSO TRACT |
|---|---|---|
| 11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved. | The USFS found numerous eagle nests, and buffer zones were established. It was determined that coal leasing can occur within the buffer zone if the nests are protected with stipulations and site mitigation plans. There were no unsuitable findings under this criterion, but lands involved in buffer zones are subject to special lease stipulations. | No active eagle nests are found on the tract. There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed. | No golden eagle roost or concentration areas occur in the general review area. Mining planned in the review area is not likely to jeopardize the continued existence of the bald eagle. Coal leasing can occur and adequate protection can be provided. There were no unsuitable findings in the general review area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 13. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected. | After consultation with USFWS, it was determined that this criterion does not apply in the general area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of high federal interest shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use. | After BLM's consultation with USFWS of intent to drop unsuitability designation of Lewis' woodpecker habitat within the PSO Tract, USFWS concurred August 2001; however, they requested that the scoria hillsides on the western edge of the exchange area be removed from the exchange or monitoring will be required in the mining permit. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish and wildlife habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable. | Sage grouse leks were found on and near the TBNG review area. However, methods of mining can be developed which will not have a significant long-term impact on the grouse or their habitat. Therefore, the areas involved in leks and buffer zones are not unsuitable. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property. | After consultation with the USGS, it was determined that floodplains can be mined with site specific stipulations and resource protection safeguards to be developed during mining and reclamation planning. Therefore, all lands within the general review area are not unsuitable for mining. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable. | There are no municipal watersheds in the general review area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable. | There are no national resource waters in the general review area. | There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining. |
| 19. Alluvial Valley Floors. All lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable. | Lands along prominent drainages were considered potential AVFs pending a final determination by the state. These lands are placed in an "available pending further study" category and are not considered unsuitable. | The State will make a final determination during the mine permit application review process. No heretofore undisturbed stream valleys are included in the PSO Tract, and there is no unsuitability finding. |
| 20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable. | The state has no applicable criteria and there is no Indian tribe located in or near the planning area. Therefore there is no unsuitability finding. | There are no unsuitability findings for this criterion on the PSO Tract. |

# APPENDIX C

THREATENED, ENDANGERED, PROPOSED AND CANDIDATE SPECIES
USFS SENSITIVE SPECIES
BLM SENSITIVE SPECIES
STATE SPECIES OF SPECIAL INTEREST

## THREATENED, ENDANGERED, PROPOSED AND CANDIDATE SPECIES

The Endangered Species Act (ESA) (16 U.S.C. 1531-1543) protects plant and animal species that are listed as T&E as well as their critical habitats. Endangered species are defined as those that are in danger of extinction throughout all or a significant portion of their range. Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their range. Proposed species are those species that have been proposed in the *Federal Register* to be listed under Section 4 of the ESA. An additional classification – candidate species (formerly Category 1 candidate species) – includes species for which the USFWS has sufficient data to list as T&E but for which development of proposed rules is precluded by higher priority listing activities.

Under provisions of the ESA, federal agencies are directed to seek to conserve endangered and threatened species and to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of their critical habitat. The following paragraphs summarize the Proposed Action and the available information on threatened, endangered, proposed, and candidate species, USFS sensitive species, and Wyoming state species of special concern that are known to be present or potentially present on the lands involved in the exchange proposal.

### Description of the Proposed Action

Under the Proposed Action, the USFS would acquire ownership of the Bridger lands which lie within BTNF and the BLM would acquire the Bridger lands which lie outside of BTNF, the JO Ranch lands and the Welch lands (see Figures 1-1, 1-2, 1-3, and 1-4 and the land descriptions in Section 2.1 of the DEIS). The Bridger and JO Ranch lands are private inholdings surrounded by lands administered by the USFS and BLM. The Welch lands are surrounded by private lands. The current owner of the lands being offered for exchange is P&M. P&M is offering to exchange the surface estate of the lands and the portion of the mineral estate that they own on those lands. P&M's ownership of the mineral estate, which is described in Section 2.1, varies from tract to tract.

If the exchange is completed under the Proposed Action, P&M would acquire an amount of federal coal equivalent in value to the properties they are offering for exchange. For the purposes of this analysis, it is assumed that P&M would acquire all of the federal coal underlying the PSO Tract (see Figures 1-1 and 1-5 and the land description in Section 2.1 of the DEIS). The majority of the surface of the PSO Tract is privately owned, and P&M is the primary private surface owner. There are 6.41 acres of BLM-administered public surface included in the

PSO Tract (see Figure 3-9 of the DEIS). If P&M acquires the coal included in the PSO Tract, they propose to open a surface coal mine and recover the coal in the tract as well as some privately-owned coal adjacent to the tract. The area proposed for mining is shown in Figure 2-2 of the DEIS.

## ENDANGERED, THREATENED, PROPOSED, AND CANDIDATE SPECIES BIOLOGY AND HABITAT REQUIREMENTS

The following species have been identified as known, suspected to occur, or potentially occurring on the lands involved in this exchange.

### Threatened Species

**Grizzly bear (Ursus arctos horribilis)**
Grizzly bears are native to North America. In the contiguous United States, they were extirpated from about 98% of their historic range between 1850 and 1950 by human-caused mortality (USFWS 1993). The Greater Yellowstone Area provides habitat for one of the five remaining populations of grizzly bears in the contiguous states. Grizzly bears in this region were listed as threatened under ESA in 1975.

Since 1975, the annual population estimate for the Yellowstone population, which is derived from the number of unduplicated females with cubs observed each year, has increased. While part of this increase may be due to changes in survey methodology, because these estimates are based on bears actually observed, they represent a minimum and thus are believed to be conservative. Recent calculations of the population's growth rate have shown an increasing trend (Eberhardt and Knight 1996).

These demographic criteria apply to both the recovery zone as well as a 10-mile wide buffer area around it. The 10-mile buffer area is included in population monitoring in recognition that many bears with home ranges in the recovery zone will also use areas outside but immediately adjacent to it.

**Bald eagle (Haliaetus leucocephalus)**
Bald eagles are a federally-listed threatened species (USFWS 1995). Bald eagles occur throughout North America from Alaska to Newfoundland, and from the southern tip of Florida to southern California. In Wyoming, this species builds large nests in the crowns of large mature trees such as cottonwoods or pines. Food availability is probably the single most important determining factor for bald eagle distribution and abundance. Fish and waterfowl are the primary sources of food where eagles occur along rivers and lakes. Big game and livestock carrion, as well as larger rodents (e.g., prairie dogs) also can be important dietary components where these resources are available (Ehrlich et al. 1988). This species is an uncommon breeding resident in Wyoming utilizing mixed coniferous

and mature cottonwood-riparian areas near large lakes or rivers as nesting habitat (Luce et al. 1999).

Bald eagles are closely associated with water, with nest sites commonly less than one mile from a lakeshore or riverbank. Large trees are necessary to support eagle nests, typically cottonwoods or several conifer species. Nest trees are often the largest trees in the stand. Typically, there are alternate nests within or in close proximity to the nest stand. Snags and open-canopied trees near the nest site and foraging areas provide favorable perch sites. Old-growth stands with their structural diversity and open canopies are an important habitat for bald eagles. Bald eagles that have open water or alternate food sources near their nesting territories may stay for the winter, other eagles migrate southward to areas with available prey.

**Canada lynx (Lynx canadensis)**

The Canada lynx was listed as a threatened species in March 2000. Lynx habitat is closely associated with the habitat requirements of snowshoe hare (Lepus americanus), its primary prey. Hares prefer dense mixed conifer stands for cover, with meadows and other openings for feeding. Red squirrels, ground squirrels, and grouse can be alternate prey items. Mature forests with downed logs and windfalls provide denning and security cover for lynx. Lynx are found in high elevation areas with deep snows where lynx have a competitive advantage over other predators. It appears historic tie hack areas are currently providing high quality lynx habitat within the Wyoming Range. These old tie hack areas contain multiple storied, mixed conifer stands with a dense understory of regenerating spruce and fir.

**Ute ladies'-tresses (Spiranthes diluvialis)**

Ute ladies'-tresses was listed as threatened on January 17, 1992 due to a variety of factors, including habitat loss and modification, and hydrological modifications of existing and potential habitat areas. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. It was then discovered in Idaho in September 1996.

Ute ladies'-tresses is a perennial herb with erect, glandular-pubescent stems 12 to 50 centimeters tall arising from tuberous-thickened roots. This species flowers from late July to September. Plants probably do not flower every year and may remain dormant below ground during drought years.

The total known population of this species is approximately 25,000 to 30,000 individuals. Occurrences range in size from one plant to a few hundred individuals. It is currently known from western Nebraska, southeastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central Idaho, southwestern Montana, and central Washington. In Wyoming, Ute ladies'-tresses

is known from the western Great Plains in Converse, Goshen, Laramie and Niobrara counties.

Rangewide, Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows or floodplains bordering springs, lakes, rivers or perennial streams at elevations between 1,780 and 6,800 ft. elevation (Fertig and Beauvais 1999). Suitable soils vary from sandy or coarse cobbley alluvium to calcareous, histic or fine-textured clays and loams. Populations have been documented from alkaline sedge meadows, riverine floodplains, flooded alkaline meadows adjacent to ponderosa pine, Douglas-fir woodlands, sagebrush steppe, and streamside floodplains. Some occurrences are also found on agricultural lands managed for winter or early season grazing or hay production. Known sites often have low vegetative cover and may be subjected to periodic disturbances such as flooding or grazing. Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999).

This species is known from four occurrences in Wyoming, all discovered between 1993-1997 (Fertig and Beauvais 1999). One of these occurrences is recorded from northwestern Converse County.

## Endangered Species

**Black-footed Ferret (Mustela nigripes)**

Black-footed ferret is a federally-listed endangered species. The black-footed ferret historically occurred throughout Texas, Oklahoma, New Mexico, Arizona, Utah, Kansas, North and South Dakota, Montana, Wyoming, Nebraska, and Colorado (USFWS 1970). The black-footed ferret is closely associated with prairie dogs, depending almost entirely upon the prairie dog for its survival. The decline in ferret populations has been attributed to the reduction in the extensive prairie dog colonies that historically existed in the western United States. Ferrets may occur within colonies of white-tailed or black-tailed prairie dogs. The USFWS has determined that, at a minimum, potential habitat for the black-footed ferret must include a single white-tailed prairie dog colony of greater than 200 acres, or a complex of smaller colonies within a 4.3 mile (7 km) radius circle totaling 200 acres (USFWS 1989). Minimum colony size for black-tailed prairie dog is 80 acres (USFWS 1989). The last known wild population was discovered in Meeteetse, Wyoming. Individuals from this population were captured and raised in protective captive breeding facilities in an effort to prevent the species' extinction (Clark and Stromberg 1987).

Recent survey efforts in the Shirley Basin have identified a population at this former re-introduction site. This is the only known population in Wyoming.

## Experimental Populations

**Gray wolf (Canis lupus)**

In 1973, the northern Rocky Mountain wolf subspecies (then known as Canis lupus irremotus) was listed as endangered, and in 1978 the legal status of the gray wolf south of Canada was listed as endangered, while the Minnesota wolf population was listed as threatened. Then in 1994 the U.S. Fish and Wildlife Service made the decision to reintroduce the gray wolf into Yellowstone National Park and classify this population as nonessential experimental wolves according to section 10(j) of the ESA as amended (USFWS 1994). All wolves occurring in the state of Wyoming are classified as nonessential experimental.

Although gray wolves are native to BTNF, human persecution resulted in the extirpation of wolves by the late 1920s. Unverified reports of wolves or wolf tracks have been received since the late 1960s within Grand Teton National Park (Grand Teton National Park wildlife observation files) and in and around BTNF (BTNF wildlife files). Human caused mortality is still a major factor limiting wolf numbers.

Reintroduction efforts in Yellowstone began in the winter of 1994-1995, and a total of 31 wolves were released over two years. The Recovery Plan for wolves in the Rocky Mountain area established a biological goal of $ 10 breeding pairs of wolves in each of the 3 recovery areas (northwestern Montana, central Idaho, and Greater Yellowstone Area) for 3 successive years. Wolf recovery has progressed faster than predicted, and populations became established within 2 years after reintroduction instead of the predicted 3-5 years. In 1999, at least 118 wolves were known to be present in the Greater Yellowstone Wolf Recovery Area, in 11 established packs averaging 9.2 wolves per pack.

The USFWS also determined "when six or more breeding pairs are established in an experimental population area, no land-use restrictions may be employed outside of national parks or national wildlife refuges, unless wolf populations fail to maintain positive growth rates toward population recovery levels for 2 consecutive years" (USFWS 1994).

**Whooping crane (Grus americana)**

In 1997, USFWS designated whooping cranes of the Rocky Mountains as experimental nonessential (USFWS 1997).

Whooping crane habitat contains wetlands, potholes and lakeshores with abundant emergent vegetation and the adjacent uplands. Cranes are sensitive to human disturbance and will abandon their nests if disturbed. Whooping cranes are rare summer residents and migrate to refuges in Texas and New Mexico for the winter.

## Proposed Species

**Mountain Plover (Charadrius montanus)**
The mountain plover is proposed for federal listing (USFWS 1999a). The USFWS has 60 days to seek input from three species experts, the public, scientific community, and Federal and State agencies. The USFWS published a 60-day extension to the comment period on April 19, 1999 (USFWS 1999b). In October 2001, the USFWS designated the mountain plover as a proposed threatened species (USFWS 2001a).

This species utilizes high, dry, shortgrass prairie with vegetation typically shorter than four inches tall. Within this habitat, areas of blue grama (Bouteloua gracilis) and buffalograss (Buchloe dactyloides) are most often utilized, as well as areas of mixed-grass associations dominated by needle-and-thread (Stipa comata) and blue grama (Dinsmore 1983).

Nests consist of a small scrape on flat ground in open areas. Most nests are placed on slopes of less than five degrees in areas where vegetation is less than three inches tall in April. More than half of identified nests occurred within 12 inches of old cow manure piles and almost twenty percent were found against old manure piles in similar habitats in Colorado. Nests in similar habitats in Montana (Dinsmore 1983) and other areas (Ehrlich et al. 1988) were nearly always associated with the heavily grazed shortgrass vegetation of prairie dog colonies.

Mountain plovers arrive on their breeding grounds in late March with egg-laying beginning in late April. Clutches are hatched by late June and chicks fledge by late July. The fall migration begins in late August and most birds are gone from the breeding grounds by late September.

**Black-tailed Prairie Dog** (Cynomys ludovicianus)
Black-tailed prairie dog was added to the list of candidate species for federal listing on February 4, 2000 (USFWS 2000a). At that time, the USFWS concluded that listing the black-tailed prairie dog was warranted but precluded by other higher priority actions to amend the lists of threatened and endangered species. No specific date for proposal for listing was given, but the USFWS has committed to reviewing the status of the species one year after publication of the above-mentioned notice (i.e. on February 4, 2001) (USFWS 2000b). As of October 2001, the candidate status of the black-tailed prairie dog status had not been changed by the USFWS (USFWS 2001a).

The black-tailed prairie dog is a highly social, diurnally active, burrowing mammal. Aggregations of individual burrows, known as colonies, form the basic unit of prairie dog populations. Found throughout the Great Plains in shortgrass and mixed-grass prairie areas (Fitzgerald et al. 1994), the black-tailed prairie dog has declined in population numbers and extent of colonies in recent years due to

habitat destruction or disturbance and pest control activities. In Wyoming, this species is primarily found in isolated populations in the eastern half of the state (Clark and Stromberg 1987). Many other wildlife species, such as the black-footed ferret, swift fox, mountain plover, ferruginous hawk and burrowing owl are dependant on the black-tailed prairie dog for some portion of their life cycle (USFWS 2000b).

This species is considered a common resident, utilizing shortgrass and mid-grass habitats in eastern Wyoming (Luce et al. 1999).

## BRIDGER LANDS

The location of the Bridger lands is shown in Figure 1-2 of the DEIS. USFS also provided general resource information for the Bridger parcels that lie within the BTNF, which is included as Appendix D.

Within the analysis area, there is no "critical" habitat designated by USFWS for threatened or endangered species. The following table is a list of threatened, endangered, experimental, candidate and proposed species known or suspected to occur in the Bridger lands that was provided to the USFS by USFWS in April 2001 (ES-61411).

Threatened, Endangered, Experimental, Proposed, and Candidate Species

| Status | Name | Status* |
|---|---|---|
| **Threatened:** | Grizzly bear (Ursus arctos horribilis) | NS |
| | Bald eagle (Haliaetus leucocephalus) | K |
| | Canada lynx (Lynx canadensis) | K |
| | Ute ladies'-tresses (Spiranthes diluvialis) | NS |
| **Endangered:** | Kendall Warm Springs Dace (Rhinichthys osculus thermalis) | NS |
| | Bonytail chub (Gila elegans) | NS |
| | Colorado pikeminnow (Ptychocheilus lucius) | NS |
| | Humpback chub (Gila cypha) | NS |
| | Razorback sucker (Xyrauchen texanus) | NS |
| | Black-footed ferret (Mustela nigripes) | NS |
| **Experimental:** | Gray wolf (Canis lupus) | S |
| | Whooping crane (Grus americana) | NS |
| **Proposed:** | Mountain plover (Charadrius montanus) | NS |
| **Candidate:** | Black-tailed prairie dog (Cynomys ludovicianus) | NS |

Status Key: K = known, S = suspected in area of influence of proposed action NS = not suspected in area of influence of proposed action

## Threatened Species

**Grizzly bear (Ursus arctos horribilis)**
Existing Environment: The Bridger parcels are approximately 60 miles from occupied habitat, the recovery area and 10-mile buffer. There have been no confirmed grizzly sightings in or near the analysis area.

Effects of Proposed Project: The Proposed Action will have no effect on grizzly bears or their habitat.

**Bald eagle (Haliaetus leucocephalus)**
Existing Environment: There is bald eagle habitat available in the analysis area, however the majority of the Bridger parcels are not typically considered bald eagle habitat (lodgepole pine, aspen, sagebrush meadow). Eagles forage on gut piles and game parts leftover from hunters in the fall regardless of the habitat type where they occur.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, bald eagles or their habitat. Any effects are likely to be beneficial. If the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure 1-2, which would consolidate USFS and BLM management in the area of the Bridger parcels. This would facilitate habitat management and protection of T&E species on the tracts by the USFS and BLM. The rights to develop the surface and mineral estates would not remain in private ownership, and the lands and minerals would not be available for private development that could potentially affect bald eagles in this area in the future.

**Canada lynx (Lynx canadensis)**
Existing Environment: It appears historic tie hack areas are currently providing high quality lynx habitat within the Wyoming Range. These old tie hack areas contain multiple storied, mixed conifer stands with a dense understory of regenerating spruce and fir. No tie hacking has occurred within or near the project area. A radio-collared lynx has been documented approximately 20 miles north of the Bridger parcels. A winter track survey was conducted winter 2000/2001 on portions of the Kemmerer District although not in the project area. A resident population is present to the north on the Big Piney Ranger District. Although no lynx activity has been documented within the Bridger parcels lynx likely do travel through the project area.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, Canada lynx and their habitat. If the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure 1-2, which would consolidate USFS and BLM management in the area of the Bridger parcels. This would facilitate habitat management and

protection of T&E species on the tracts by the USFS and BLM. The lands and minerals would not be available for private development that could potentially affect Canada lynx if they do establish a presence in this area in the future.

**Ute ladies'-tresses (Spiranthes diluvialis)**
Existing Environment: Ute ladies'-tresses has not been located and is not expected as the analysis area is above the expected elevation range of this plant. However, no survey work has occurred.

Effects of Proposed Project: In BTNF, the Proposed Action will have no effect on Ute ladies'-tresses.

## Endangered Species

**Black-footed ferret (Mustela nigripes)**
Existing Environment: Black-footed ferrets are potential residents in prairie dog (Cynomys sp.) colonies. There are no prairie dog colonies in or near the project area.

Effects of the Proposed Project: In BTNF, the Proposed Action will have no effect on black-footed ferrets.

**Kendall Warm Springs Dace, Bonytail Chub, Colorado Pikeminnow, Humpback Chub, and Razorback Sucker**
Existing Environment: The Kendall Warm Springs dace does not occur on the Kemmerer Ranger District or within the project area; it only occurs within the Kendall Warm Springs located on the Pinedale Ranger District. Bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker are native to the Upper Colorado River Basin within mainstem river channels, not the project area's headwater streams.

Effects of the Proposed Action: The Proposed Action will have no effect on the Kendall Warm Springs dace, bonytail chub, Colorado pikeminnow, humpback chub, or razorback sucker.

## Experimental Populations

**Gray wolf (Canis lupus)**
Existing Environment. Three of the Greater Yellowstone Area packs, the Teton, Gros Ventre, and Soda Butte packs, all included BTNF within their home range in 1999. Two of these packs used BTNF in 2000 and 2001 (Teton and Gros Ventre packs). Pack activity has been predominantly on the Teton Division of BTNF, a considerable distance north of the project area. Single wolves have been documented on the Pinedale Ranger District, Grey's River District, and as far south as Kemmerer. Conflicts have occurred between wolves and domestic

livestock and dogs both on USFS system lands and on private lands as far south as Kemmerer. No single wolves or pack activity has been documented on the Bridger parcels.

Effects of Proposed Project: The Proposed Action is not likely to jeopardize the continued existence of the experimental gray wolf population. However, if the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure 1-2, which would consolidate USFS and BLM management in the area of the Bridger parcels. This would facilitate habitat management and protection of T&E species on the tracts by the USFS and BLM. The lands and minerals would not be available for private development that could potentially affect gray wolves if they do establish a presence in this area in the future.

**Whooping crane (Grus americana)**

Existing Environment: Whooping cranes have been documented on BTNF in the Upper Green River drainage during summer months, a considerable distance north of the project area. Typically one bird is seen, but this single bird has not been seen for a number of years. No reproductive activity has occurred. In addition, no suitable habitat is located within the project area.

Effects of Proposed Project: The Proposed Action will have no effect on whooping cranes.

## Proposed Species

**Mountain plover (Charadrius montanus)**

Existing Environment: Mountain plover is a potential resident in shortgrass prairie and shrub-steppe landscapes. The Bridger lands are primarily forested. No potential habitat exists in the project area.

Effects of the Proposed Project: In BTNF, the Proposed Action will have no effect on mountain plover.

## Candidate Species

**Black-tailed Prairie Dog (Cynomys ludovicianus)**

Existing Environment: There are no prairie dog colonies in or near the project area.

Effects of the Proposed Project: In BTNF, the Proposed Action will have no effect on black-tailed prairie dogs.

## JO RANCH LANDS, WELCH LANDS, AND PSO TRACT

The locations of the JO Ranch lands, Welch lands, and PSO Tract are shown in Figure 1-3, 1-4 and 1-5, respectively, of the DEIS.

The following list of threatened, endangered and proposed species that might be present in these areas is based on information provided by the USFWS.

Threatened, Endangered, Candidate, and Proposed Species Potentially Present in the Area of the JO Ranch Lands, Welch Lands and PSO Tract.

| Status | Name |
|---|---|
| **Threatened:** | Bald eagle (Haliaetus leucocephalus) |
| | Canada lynx (Lynx canadensis) |
| | Ute ladies'-tresses (Spiranthes diluvialis) |
| **Endangered:** | Black-footed ferret (Mustela nigripes) |
| | Colorado Pikeminnow (Ptychocheilus lucius) |
| | Humpback Chub (Gila cypha) |
| | Bonytail Chub (Gila elegans) |
| | Razorback Sucker (Xyrauchen texanus) |
| **Proposed:** | Mountain plover (Charadrius montanus) |
| **Candidate:** | Black-tailed prairie dog (Cynomys ludovicianus) |

### JO Ranch Lands

Existing Environment: Cow Creek flows through the JO Ranch lands that the BLM Rawlins Field Office would acquire. Cow Creek is a tributary of Muddy Creek which is within the Colorado River Basin. The Colorado pikeminnow, humpback chub, bonytail chub, and razorback sucker, which are endangered species, are native to the Upper Colorado River Basin. The USFWS has determined that water depletion projects occurring within the Colorado River Basin may affect these four fish species. Furthermore, any new depletion over 100 ac-ft will require a payment to the National Fish and Wildlife Foundation and legal protection of instream flows will occur.

There is potential for Ute ladies'-tresses to occur on these lands; however, the JO Ranch lands have not been surveyed at this time.

There also is potential for mountain plover habitat to occur on the JO Ranch lands on the non-riparian parcels associated with the lands proposed exchange.

Effects of the Proposed Project: The proposed land exchange may affect, but is unlikely to adversely effect, the Colorado River endangered fishes, Ute ladies'-tresses and mountain plovers. If the exchange is completed, BLM would acquire surface ownership of the JO Ranch lands shown in Figure 1-3, which would consolidate BLM management in this area. This would facilitate habitat management and protection of T&E species on these lands by BLM. The rights to develop the surface would not remain in private ownership, and the lands would not be available for private development that could potentially affect T&E species in the future. The rights to develop the mineral estate would not be changed if the exchange is completed.

Welch Lands

Existing Environment: The Tongue River flows through the Welch lands that the BLM Buffalo Field Office would acquire if the exchange is completed. Bald eagle, black-footed ferret, Ute ladies'-tresses, mountain plover, and black-tailed prairie dogs could occur on these lands. Bald eagles and black-tailed prairie dogs have been observed or documented on the Welch lands. Bald eagles are a winter resident along the Tongue River; however no roost locations or nest sites have been identified. There is an active bald eagle nest approximately 2 miles downstream from the Welch lands on the Tongue River. There is a small (approximately 20 acre) black-tailed prairie dog town on the property. The "town" is not large enough to support a black-footed ferret population. No mountain plovers have observed in the area.

Effects of the Proposed Project: The proposed land exchange may affect, but is unlikely to adversely effect, the bald eagle and mountain plover; there will be no effect to the black-footed ferret and Ute ladies'-tresses. If the exchange is completed, BLM would acquire surface and coal ownership of the Welch lands shown in Figure 1-4. This would facilitate habitat management and protection of T&E species on these lands by the BLM. The exchange would create an area of public land management and public access adjacent to the Tongue River in Wyoming which does not currently exist outside the Big Horn National Forest. If the exchange is completed, future management of the land acquired in the Buffalo Field Office area would be determined through additional NEPA analysis/ planning decisions. The rights to develop the surface and coal would not remain in private ownership and the lands would not be available for private development that could potentially affect T&E species in the future. The rights to develop the

remainder of the mineral estate would not be changed if the exchange is completed.

PSO Tract

Existing Environment: A list of threatened, endangered, proposed and candidate plant and wildlife species that would potentially occur in the PSO Tract area was received from USFWS (USFWS January 2001). Threatened, endangered, proposed, and candidate species that could potentially be present in the region include: bald eagle, Canada lynx, black-footed ferret, Ute ladies' tresses, mountain plover and black-tailed prairie dog.

The federally listed plant species Ute ladies'-tresses (Spiranthes diluvialis) was not observed during the seasonal field surveys completed during 2000-2001.

The bald eagle (Haliaetus leucocephalus) is a threatened wildlife species which is a common winter resident and migrant and has been observed foraging on the study area during past surveys. This species nests along the Tongue River several miles east of the PSO Tract area.

The Canada lynx (Lynx canadensis) is a threatened wildlife species which was listed by the USFWS as potentially occurring in the region, however, habitat for this species is not present in the area of the PSO Tract.

The black-footed ferret (Mustela nigripes) is an endangered species which is found almost exclusively living in prairie dog towns. Several small prairie dog towns were observed on the PSO Tract (Figure 3-8). Ferret searches have not indicated that they are present in the area.

The mountain plover (Charadrius montanus) is proposed for listing. As indicated in Table 3-7, mountain plovers have not been documented on or near the PSO Tract. Suitable habitat for this species was surveyed in 2001 and no mountain plovers were observed.

The black-tailed prairie dog (Cynomys ludovicianus) is a candidate species. Several small prairie dog towns were observed on the PSO Tract. These prairie dog towns are located in NE¼ Section 21, NW¼ Section 22, SE¼ Section 20, NE¼ Section 29 and NW¼ Section 27, T.58N., R.84N. (Figure 3-8). Several other prairie dog towns are known to exist within several miles of the PSO Tract.

Effects of the Proposed Project: The proposed land exchange may affect, but is unlikely to adversely affect, the bald eagle, Canada lynx, black-footed ferret, black-tailed prairie dog, Ute ladies'-tresses, and mountain plovers. If the exchange is completed as proposed, P&M would acquire ownership of the federal coal included

in the PSO Tract. The surface of the PSO Tract is privately owned, and P&M is the primary surface land owner. P&M proposes to mine the coal if they acquire it.

The potential for direct or indirect effects to Ute ladies'-tresses would be minimal. The nearest known population occurrence of this species lies more than 100 miles southeast of the PSO Tract. The plant was not observed during the seasonal field surveys completed on the PSO Tract during 2000-2001. Prior to approval of the mining and reclamation plan, additional surveys would be required. Because of the ability of this species to persist below-ground or above-ground without flowering, single season surveys that meet the current USFWS survey guidelines may not detect populations. As a result, part or all of undetected populations could be lost to surface-disturbing activities.

If P&M acquires the federal coal in the PSO Tract and opens a surface coal mine, there would be new levels of human disturbance on the tract that could impact nesting and wintering bald eagles in the area. Eagles may alter foraging patterns as they fly around areas of active mining activity. Bald eagle foraging habitat would be lost on the tract during mining and before reclamation. This loss of potential prey habitat would be short-term. Foraging habitat that would be lost during mining would be replaced as reclamation proceeds on mined-out areas. The potential for eagles to collide with or be electrocuted by electric power lines on the mine site is minimal due to the use of raptor safe power lines. An increase in the volume and frequency of traffic on the roads accessing the PSO Tract may result in an increase in vehicular collisions and roadside carcasses. This could result in an increase of bald eagle foraging along roads in this area.

If the exchange is completed as proposed, there should be no effect on Canada lynx because there is no habitat for Canada lynx in the area of the PSO Tract.

The potential for direct or indirect effects to the black-footed ferret are expected to be minimal if the exchange is completed and P&M acquires and mines the coal in the PSO Tract. There are no known populations of this species in this area. Ferret searches of the small prairie dog towns located on the PSO Tract found no indication of ferrets. Prior to approval of the mining and reclamation plan, additional surveys would be required.

Mountain plovers could be impacted by the disturbance of suitable habitat on the tract during mining operations, if the exchange is completed and P&M acquires and mines the coal in the PSO Tract. Mountain plovers have not been documented on or near the tract and no mountain plovers were observed during surveys of suitable habitat for this species in 2001. Prior to approval of the mining and reclamation plan, additional surveys would be required and restoration of mountain plover habitat could be required as part of the mining and reclamation permit.

There would be direct and indirect effects on individuals and populations of the black-tailed prairie dog if the exchange is completed and P&M acquires and mines the coal in the PSO Tract. Individuals and colonies on the tract would be impacted by mine disturbance. Increased vehicle traffic would increase the potential for vehicle collisions, reducing population levels in colonies adjacent to existing and new roads.

Regulatory Requirements and Mitigation for PSO Tract: If the exchange is completed, P&M would acquire ownership of the federal coal included in the PSO Tract. Ownership of the coal does not authorize mining operations. No operations can occur on the leased lands until the approval of a state mining and reclamation permit under the applicable Wyoming state regulations (see Section 1.2: Regulatory Authority and Responsibility).

As part of the permit application and approval processes, P&M would be required to conduct additional surveys and other evaluations as needed to ensure compliance with the ESA. Coordination with the USFWS during the permit application review process should resolve any potential impacts that are confirmed. If the impacts cannot be satisfactorily resolved, the State regulatory authority would condition any resulting permit to mine coal with species-specific protective measures. The permit application and approval process would be based on the most current survey information and an actual detailed site-specific mining and reclamation proposal.

The following is a partial list of measures that the State of Wyoming could require as part of the mining and reclamation permit in accordance with the state regulatory requirements:

- Avoiding bald eagle disturbance;
- Restoring bald eagle foraging areas disturbed by mining;
- Restoring mountain plover habitat;
- Using raptor safe power lines;
- Surveying for Ute ladies'-tresses if habitat is present;
- Surveying for mountain plover if habitat is present;
- Surveying for black-footed ferrets in prairie dogs towns potentially affected by mining.

## CUMULATIVE IMPACTS

If the exchange is completed as proposed, BLM and USFS would acquire surface lands and minerals currently owned by P&M in three areas of Wyoming (described in Chapter 2 of this DEIS). P&M would acquire the federal coal included in the PSO Tract (also described in Chapter 2 of this DEIS).

Acquisition of the Bridger lands and JO Ranch lands would have small but beneficial cumulative effects on the T&E plant and animal species in these areas because the tracts offered for exchange are relatively small inholdings of private land surrounded by USFS- and BLM-administered lands. Federal surface management in these areas would be consolidated and the opportunity for private surface developments, such as subdivisions and/or construction activities, which could impact T&E species on these lands and the surrounding public lands would be eliminated.

Acquisition of the Welch lands, which are surrounded by other private lands, would have a small but beneficial cumulative effect on T&E species on these lands because the opportunity for private surface development, such as subdivisions or construction activities which could impact T&E species, would be eliminated. Opportunities for recreational activities on the Welch lands would be increased if they become public lands, which may have impacts on T&E species. Opportunities for coal development would require state approval if the exchange is completed and the coal is acquired by BLM. Opportunities for oil and gas development would be unchanged on these lands because the oil and gas estate would remain in private ownership.

If the exchange is completed as proposed and P&M acquires and mines the coal in the PSO Tract, the mining operations would contribute to cumulative effects to T&E plant and wildlife species in the PRB. Other activities that are contributing to cumulative effects to T&E plant and wildlife species in the PRB include coal mining in Campbell and Converse Counties, Wyoming and Big Horn County, Montana; conventional and CBM oil and gas development; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; road, railroad, and power plant construction; recreational activities; and rural and urban housing development. Mining and construction activities and urban development tend to have more intense impacts on fairly localized areas, while ranching, recreational activities, and oil and gas development tend to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. The net area of energy disturbance in the Wyoming PRB is increasing overall, however, as new areas of disturbance are added, mined-out areas are restored and reclaimed, and oil and gas well sites are reclaimed when depleted oil and gas wells are abandoned.

The total acreage affected by coal mining and oil and gas development would not be disturbed simultaneously, because development would occur over the life of the operations. Some of the disturbed acreage would be reclaimed or would be in the process of being reclaimed when new disturbances are initiated. In the near future, the amount of disturbed T&E plant and wildlife habitats is likely to increase, although reclamation would eventually overtake new development.

Cumulative effects would also occur to T&E plant and wildlife resources as a result of indirect impacts. One factor is the potential import and spread of noxious weeds around roads and facilities. Noxious weeds have the ability to displace native vegetation and hinder reclamation efforts. If weed mitigation and preventative procedures are applied to all construction and reclamation practices, the impact of noxious weeds on T&E plants and wildlife would be minimized.

In reclaimed areas, vegetation cover often differs from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the area, however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Establishment of noxious weeds and alteration of vegetation reclaimed areas has the potential to alter T&E plant and wildlife habitat composition and distribution. As a result, shifts in habitat composition or distribution may affect T&E plant and wildlife species in the PRB.

## USFS INTERMOUNTAIN REGION SENSITIVE SPECIES

Sensitive species are defined as those plants and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: 1) significant current or predicted downward trends in population numbers or density, or 2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (USFS Manual 2670.5).

The USFS objective for sensitive species management is to "develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions" (USFS Manual 2670.22). There are numerous sensitive species that do or could occur within the analysis area.

The following fish and wildlife species have been designated as Sensitive by the Intermountain Region of the USFS and may occur in the analysis area.

USFS Intermountain Fish and Wildlife Sensitive Species

| **Name** | **Status** * |
|---|---|
| **Fish:** | |
| Colorado River cutthroat trout (Oncorhynchus clarki pleuriticus) | K |
| Snake River fine spotted cutthroat trout (Oncorhynchus clarki sp.) | NS |
| | |
| **Wildlife:** | |
| Spotted frog (Rana pretiosa) | S |
| Common loon (Gavia immer) | NS |
| Harlequin duck (Histrionicus histrionicus) | NS |
| Trumpeter swan (Cyngus buccinator) | NS |
| Boreal owl (Aegolius funereus) | S |
| Flammulated owl(Otus flammeolus) | S |
| Three-toed woodpecker (Picoides tridactylus) | S |
| Townsend's big-eared bat (Plecotus townsendii) | NS |
| Wolverine (Gulo gulo) | K |
| Fisher (Martes pinnanti) | NS |
| Northern goshawk (Accipiter gentilis) | S |
| Great gray owl (Strix nebulosa) | S |
| Spotted bat (Euderma maculatum) | NS |
| Peregrine falcon (Falco pergrinus) | NS |

*Status Key: K = known, S = suspected in area of influence of proposed action, NS = not suspected in area of influence of proposed action

Suitable habitat exists for spotted frog, boreal owl, flammulated owl, three-toed woodpecker, wolverine, fisher, northern goshawk, and great gray owl.

Spotted Frog, Population and Habitat Status

No spotted frogs have been located on the Kemmerer District although suitable habitat exists. The most recent survey work was conducted in Ham's Fork in 1999 (Patla 2000). No survey work has been done on the Bridger parcels. Range maps for spotted frogs conflict; some include the Kemmerer Ranger District while others do not.

Spotted frog habitat primarily includes oxbow ponds (without fish) with emergent sedges (Carex spp.) located in wet meadows at the edge of lodgepole pine (Pinus contorta) forest. Frogs move considerable distances from water after breeding, often frequenting mixed conifer and subalpine forests, grasslands, and shrublands of sagebrush and rabbitbrush. Beaver ponds also provide good spotted frog habitat.

Flammulated Owl, Population and Habitat Status

Flammulated owls have not been documented on the Kemmerer Ranger District, but no survey work has occurred. This owl prefers ponderosa pine habitat, but will also utilize Douglas-fir, aspen, and/or limber pine. Douglas-fir, aspen, and limber pine are present within the Bridger parcels but in limited quantities. The flammulated owl requires cavities for nesting and forages primarily on forest insects. This owl is suspected to be present, but rare.

Boreal Owl, Three-Toed Woodpecker, Great Gray Owl, Goshawk, Population and Habitat Status

These species inhabit montane stands of coniferous, deciduous and mixed trees. No survey work has been done within the analysis area, but suitable habitat exists, and the lack of documented sightings is probably the result of lack of survey efforts.

Boreal owls have been documented to the north along the Grey's River. All breeding sites were above 2100 meters or approximately 6900 ft. (Clark 1994). The boreal owl prefers the high elevation spruce-fir forests or aspen for foraging and nesting. Nesting habitat structure consists of forest with a relatively high density of large trees, open understory, and multilayered canopy. Boreal owls are cavity nesters and are dependent on the presence of primary excavators such as the northern flicker (Wisdom et al. 2000).

No documented sightings of three-toed woodpeckers exist for the Kemmerer District. These woodpeckers require snags in coniferous forests for nesting, feeding, perching and roosting. In Wyoming forests, the three-toed woodpecker is found in only large, unbroken stands of mature spruce-fir and lodgepole pine. Snags with DBH of 12-16 inches and heights of 19.6 to 39.4 ft. are preferred (USFS 1991). This woodpecker forages on insects, mainly in dead trees, but will also feed in live trees. Wood boring beetles are preferred, and this woodpecker is

adapted to shift foraging areas to capitalize on high concentrations of these beetles (Wisdom et al. 2000).

No documented sightings of great gray owls exist for the Kemmerer District. The great gray owl uses mixed coniferous forests usually bordering small openings or meadows. Semi-open areas, where small rodents are abundant, near dense coniferous forests, for roosting and nesting, is optimum habitat for the great gray owls. Broken top snags, stumps, dwarf-mistletoe platforms, or old hawk and raven nests are utilized for nesting.

The WGFD Wildlife Observation System contains 38 goshawk records since 1979 for the Kemmerer District. The goshawk prefers old growth forests for nesting but forages in a variety of habitats. Goshawk habitat was modeled for the Commissary Ridge/Tunp Range Landscape Scale Assessment (2001) utilizing the following factors: conifer vegetation, northerly aspects between 270 and 90 degrees, and slopes less than 30 percent. Potential habitat was mostly located in the lower elevations along Hams Fork and Fontenelle Creeks.

<u>Wolverine and Fisher, Population and Habitat Status</u>
Wolverines inhabit high mountain forests of dense conifers; primarily in true fir (Abies) cover types as well as subarctic-alpine tundra. They are widespread, but occur in low densities. They are difficult to observe so frequency of sightings may not reflect population size. Maintenance of wolverine populations is dependent on large areas free from land-use activities that permanently alter their habitat (USFS 1994). Wolverines have been documented in several locations near the analysis area.

Fishers use closed coniferous and mixed forests. They prefer extensive, mature to old growth spruce-fir forests with high canopy closure. There are no documented sightings on the Bridger parcels, either historic or recent.

**USFS Intermountain Region Sensitive Plant Species**

Region 4 - BTNF Potential Sensitive Plant Species

| SPECIES | HABITAT/ COMMUNITY | ELEVATION (Feet) | SUCCESSION |
|---|---|---|---|
| Pink agoseris (Agoseris lackschewitzii) | Subalpine wet meadow, saturated soils | 8500-10600 | Mid to late |
| Sweet-flowered rock jasmine (Androsace chamaejasme var. carinata) | Montane rock crevices in rocky limestone or dolomite soils | 8500-10800 | Mid to late |
| Soft aster (Aster mollis) | Sagebrush grasslands and mountain meadows in calcareous soils | 6400-8500 | Early to mid |
| Meadow milkvetch (Astragalus diversifolius var. diversifolius) | Moist, often alkaline meadows and swales in sagebrush valleys | 4400-6300 | Mid |
| *Starveling milkvetch (Astragalus jejunus var. jejunus) | Dry barren ridges and bluffs of shale and stone, clay or cobblestones | 6000-7100 | Early to late |
| *Payson's milkvetch (Astragalus paysonii) | Disturbed areas and recovering burns on sandy soil | 6700-9600 | Early |
| Seaside sedge (Carex incurviformis) | Alpine and subalpine moist tundra and wet rock ledges | 10000-12200 | Late |
| Seaside sedge (Carex incurviformis) | Alpine and subalpine moist tundra and wet rock ledges | 10000-12200 | Late |
| Black and purple sedge (Carex luzulina var. atropurpurea) | Subalpine wet meadows and stream sides | 10000-10600 | Mid |
| Wyoming tansymustard (Descuraania torulosa) | Sparely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone | 8300-10000 | Early to mid |
| Boreal draba (Draba borealis) | Moist north-facing limestone slopes and cliffs and shady stream sides | 6200-8600 | Mid |

Region 4 - BTNF Potential Sensitive Plant Species (continued)

| SPECIES | HABITAT/ COMMUNITY | ELEVATION (Feet) | SUCCESSION |
|---|---|---|---|
| Rockcress draba (Draba densifolia var. apiculata) | Moist gravelly alpine meadows and talus slopes, often on limestone-derived soils | 10400-12000 | Mid to late |
| Wooly fleabane (Erigeron lanatus) | Alpine or subalpine limestone talus slopes | 11000 | Mid to late |
| Narrowleaf goldenweed (Haplopappus macronema var. linearis) | Semi-barren, whitish clay flats and slopes, gravel bars, and sandy lake shores | 7700-10300 | Mid to late |
| *Payson's bladderpod (Lesquerella paysonii) | Rocky, sparsely-vegetated slopes, often calcareous substrates | 6000-10300 | Mid to late |
| Naked-stemmed parrya (Parrya nudicaulis) | Alpine talus, often on limestone substrates | 10700-11400 | Early to late |
| *Creeping twinpod (Physaria integrifolia var. monticola) | Barren, rocky, calcareous hills and slopes | 6500-8600 | Mid |
| Greenland primrose (Primula egaliksensis) | Wet meadows along streams and calcareous montane bogs | 6600-8000 | Mid |
| Weber's saw-wort (Saussurea weberi) | Alpine talus and gravel fields, often on limestone | 10200-11200 | Mid to late |

* Present on Kemmerer Ranger District as per the Wyoming Natural Diversity database

Population and Habitat Status

Four sensitive plant species are known to occur on the Kemmerer Ranger District according to the Wyoming Natural Diversity database: creeping twinpod, Payson's milkvetch, Payson's bladderpod, and Starveling milkvetch. These plants are not documented within the project area, although no survey work has occurred.

The following sensitive plant species are probably not present as their habitat requirements are outside the elevation range of the project area (7200 ft. to 9300 ft.): meadow milkvetch, seaside sedge, black and purple sedge, rockcress draba, wooly fleabane, naked-stemmed parrya, and Weber's saw-wort.

Status of the following species is unknown; they may or may not occur in the project area: pink agoseris, sweet-flowered rock jasmine, soft aster, Wyoming tansymustard, boreal draba, Narrowleaf goldenweed, and Greenland primrose.

Effects of the Proposed Project on USFS Intermountain Region Sensitive Species: The Proposed Action would consolidate USFS management in the area of the Bridger parcels. This would facilitate habitat management and protection of USFS Intermountain Region sensitive species on the tracts by the USFS and ensure that the privately-owned Bridger parcels would not be sold to another private party and potentially subdivided in the future.

**BLM SENSITIVE SPECIES EVALUATION**
**Bureau of Land Management**
**Pittsburg & Midway Land Exchange**

## INTRODUCTION

BLM Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the ESA, as amended; Title II of the Sikes Act, as amended; the FLPMA; and the Department Manual 235.1.1A., General Program Delegation, Director, BLM.

The goals of the sensitive species policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure sensitive species are considered in land management decisions.
- Prevent a need for species listing under the ESA.
- Prioritize needed conservation work with an emphasis on habitat.

## PROJECT DESCRIPTION

Under the Proposed Action, BLM would acquire the Bridger lands which lie outside of the BTNF, the JO Ranch lands and the Welch lands (see Figures 1-1, 1-2, 1-3, and 1-4 and the land descriptions in Section 2.1 of the DEIS text). The Bridger and JO Ranch lands are private inholdings surrounded by lands administered by the USFS and BLM. The Welch lands are surrounded by private lands. The current owner of the lands being offered for exchange is P&M. P&M is offering to exchange the surface estate of the lands and the portion of the mineral estate that they own on those lands. P&M's ownership of the mineral estate, which is described in Section 2.1, varies from tract to tract.

If the exchange is completed under the Proposed Action, P&M would acquire an amount of federal coal equivalent in value to the properties they are offering for exchange. For the purposes of this analysis, it is assumed that P&M would acquire all of the federal coal underlying the PSO Tract (see Figures 1-1 and 1-5 of the DEIS text and the land description in Section 2.1 of the DEIS text). The majority of the surface of the PSO Tract is privately owned, and P&M is the primary private surface owner. There are 6.41 acres of BLM-administered public surface included in the PSO Tract (see Figure 3-9). If P&M acquires the coal included in the PSO Tract, they propose to open a surface coal mine and recover the coal in the tract as well as some privately-owned coal adjacent to the tract. The area proposed for mining is shown in Figure 2-2.

## SPECIES OCCURRENCE AND HABITAT DESCRIPTIONS

Sensitive species were listed for the BLM field offices within their range. Numerous sensitive species do or could occur within the tracts being exchanged. Specialized habitat requirements (i.e. caves, cliffs, calcareous rock outcrops) make occupation for other sensitive species unlikely. Table 1 lists BLM sensitive species and summarizes their habitat requirements.

## DETERMINATION OF EFFECTS

### Bridger Lands, JO Ranch Lands, and Welch Lands

The proposed land exchange will be a beneficial effect for sensitive species management on the lands being acquired by BLM.

The BLM will acquire surface ownership of the Bridger lands outside the BTNF, the JO Ranch lands, and the Welch lands. Mineral estates owned by P&M within these tracts would also be exchanged to BLM. Development rights would not remain in private ownership, and the lands would not be available for private development that could impact sensitive species. Future management of the lands acquired by BLM would be determined through additional NEPA analysis/planning decisions where sensitive species management will be considered.

### PSO Tract

Private ownership of the PSO Tract mineral estate may impact individuals and habitat, but is unlikely to lead towards federal listing of BLM sensitive species.

If the exchange is completed, P&M would acquire ownership of the federal coal included in the PSO Tract. Ownership of the coal does not authorize mining operations. No operations can occur on the leased lands until the approval of a state mining and reclamation permit under the applicable Wyoming state regulations (see Section 1.2: Regulatory Authority and Responsibility).

As part of the permit application and approval processes, P&M would be required to conduct wildlife surveys and other evaluations to ensure compliance with the ESA, the Migratory Bird Treaty Act, and other state and federal legislation. Coordination with the USFWS during the permit application review process should minimize potential impacts. If the impacts cannot be satisfactorily resolved, the State regulatory authority would condition any resulting permit to mine coal with species-specific protective measures. The permit application and approval process would be based on the most current survey information and an actual detailed site-specific mining and reclamation proposal.

Table 1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office

| **Common Name (scientific name)** | **Habitat** | **Kemmerer Field Office[1]** | **Rawlins Field Office[2]** | **Buffalo Field Office[3]** |
|---|---|---|---|---|
| **Amphibians** | | | | |
| Boreal toad (Bufo boreas boreas) | Pond margins, wet meadows, riparian areas | Yes | Yes | No |
| Great Basin Spadefoot (Spea intermontana) | Spring seeps, permanent and temporary water | Yes | Yes | No |
| Northern leopard frog (Rana pipiens) | Beaver ponds, permanent water in plains and foothills | Yes | Yes | Yes |
| Spotted frog (Ranus pretiosa) | Ponds, sloughs, small streams | Yes | No | Yes |
| **Birds** | | | | |
| Baird's sparrow (Ammodramus bairdii) | Grasslands, weedy fields | No | Yes | Yes |
| Brewer's sparrow (Spizella breweri) | Basin-prairie shrub | Yes | Yes | Yes |
| Burrowing owl (Athene cunicularia) | Grasslands, basin-prairie shrub | Yes | Yes | Yes |
| Columbian sharp-tailed grouse (Tympanuchus phasianellus columbianus) | Grasslands | No | Yes | No |
| Ferruginous hawk (Buteo regalis) | Basin-prairie shrub, grasslands, rock outcrops | Yes | Yes | Yes |
| Greater sage-grouse (Centrocercus urophasianus) | Basin-prairie shrub, mountain-foothill shrub | Yes | Yes | Yes |
| Loggerhead shrike (Lanius ludovicianus) | Basin-prairie shrub, mountain-foothill shrub | Yes | Yes | Yes |
| Long-billed curlew (Numenius americanus) | Grasslands, plains, foothills, wet meadows | Yes | Yes | Yes |
| Northern goshawk (Accipiter gentilis) | Conifer and deciduous forests | Yes | Yes | Yes |

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table 1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued)

| Common Name (scientific name) | Habitat | Kemmerer Field Office[1] | Rawlins Field Office[2] | Buffalo Field Office[3] |
|---|---|---|---|---|
| Peregrine falcon (Falco peregrinus) | Cliffs | Yes | Yes | Yes |
| Sage sparrow (Amphispiza billneata) | Basin-prairie shrub, mountain-foothill shrub | Yes | Yes | Yes |
| Sage thrasher (Oreoscoptes montanus) | Basin-prairie shrub, mountain-foothill shrub | Yes | Yes | Yes |
| Trumpeter swan (Cygnus buccinator) | Lakes, ponds, rivers | Yes | Yes | Yes |
| White-faced ibis (Plegadis chihi) | Marshes, wet meadows | Yes | Yes | Yes |
| Yellow-billed cuckoo (Coccyzus americanus) | Open woodlands, streamside willow and alder groves | Yes | Yes | Yes |
| **Fish** | | | | |
| Bluehead sucker (Catostomus discobolus) | Bear, Snake, and Green river drainages, all waters | Yes | Yes | No |
| Bonneville cutthroat (Oncorhynchus clarki utah) | Bear River drainage | Yes | No | No |
| Colorado cutthroat (O. clarki pleuriticus) | Colorado River drainage | Yes | Yes | No |
| Fine-spotted cutthroat (O. clarki spp.) | Snake River drainage | Yes | No | No |
| Flannelmouth sucker (Catostomus latipinnis) | Colorado River drainage, large rivers, streams and lakes | Yes | Yes | No |
| Leatherside chub (Gila copei) | Bear, Snake, and Green river drainages | Yes | No | No |
| Roundtail chub (Gila robusta) | Colorado River drainage, mostly large rivers, streams and lakes | Yes | Yes | No |

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[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table 1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued)

| **Common Name (scientific name)** | **Habitat** | **Kemmerer Field Office[1]** | **Rawlins Field Office[2]** | **Buffalo Field Office[3]** |
|---|---|---|---|---|
| Yellowstone cutthroat (O. clarki bouvieri) | Mountain streams and rivers in Yellowstone drainage | No | No | Yes |
| **Mammals** | | | | |
| Dwarf Shrew (Sorex nanus) | Mountain foothill shrub, grasslands | Yes | Yes | Yes |
| Fringed myotis (Myotis thysanodes) | Conifer forests, woodland chaparral, caves and mines | No | Yes | Yes |
| Long-eared myotis (Myotis evotis) | Conifer and deciduous forest, caves and mines | Yes | Yes | Yes |
| Pocket gopher (Thomomys spp.) | Grasslands and shrublands | Yes | Yes | No |
| Pygmy rabbit (Brachylagus idahoensis) | Basin-prairie and riparian shrub | Yes | No | No |
| Spotted bat (Euderma maculatum) | Cliffs over perennial water, basin-prairie shrub | No | No | Yes |
| Swift fox (Vulpes velox) | Grasslands | No | Yes | Yes |
| Townsend's big-eared bat (Corynorhinus townsendii) | Forests, basin-prairie shrub, caves and mines | No | Yes | Yes |
| White-tailed prairie dog (Cynomys leucurus) | Basin-prairie shrub, grasslands | Yes | Yes | No |
| **Plants** | | | | |
| Beaver Rim phlox (Phlox pungens) | Sparsely vegetated slopes on sedimentary substrates; 6,000 to 7,400 ft. | Yes | No | No |
| Cary beardtongue (Penstemon caryi) | Calcareous rock outcrops and rocky soil in sage, juniper, Douglas-fir and limber pine communities, 5200 to 8500 ft. | No | No | Yes |

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[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table 1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued)

| **Common Name (scientific name)** | **Habitat** | **Kemmerer Field Office[1]** | **Rawlins Field Office[2]** | **Buffalo Field Office[3]** |
|---|---|---|---|---|
| Cedar Rim thistle (Cirsium aridum) | Chalky hills, gravelly slopes, & fine textured sandy-shale draws; 6,700 to 7,200 ft. | No | Yes | No |
| Dorn's twinpod (Physaria dornii) | Dry, calcareous-shaley soils in mountain mahogany and rabbitbrush communities; 6,500 to 7,200 ft. | Yes | No | No |
| Entire-leaved peppergrass (Lepidium integrifolium integrifolium) | Greasewood communities on clay hummocks and moist alkaline meadows; 6,200 to 6,770 ft. | Yes | No | No |
| Gibbens' beardtongue (Penstemon gibbensii) | Sparsely vegetated shale or sandy-clay slopes; 5,500 to 7,700 ft. | No | Yes | No |
| Laramie columbine (Aquilegia laramiensis) | Crevices in granite, 6,400 to 8,000 ft. | No | Yes | No |
| Laramie false sagebrush (Sphaeromeria simplex) | Cushion plant communities on rocky limestone; 7,500 to 8,600 ft. | No | Yes | No |
| Large-fruited bladderpod (Lesquerella macrocarpa) | Gypsum-clay hills, benches, and flats; 7,200 to 7,700 ft. | Yes | No | No |
| Nelson's milkvetch (Astragalus nelsonianus) | Specialized habitats in sparsely vegetated shrubland and cushion plant communities; 5,200 to 7,600 ft. | No | Yes | No |
| Pale blue-eyed grass (Sisyrinchium pallidum) | Wet meadows, streambanks, roadside ditches, and irrigated meadows; 7,000 to 7,900 ft. | No | Yes | No |
| Persistent sepal yellowcress (Rorippa calycina) | Riverbanks and shorelines on sandy soils | No | Yes | No |
| Porter's sagebrush (Artemisia porteri) | Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300 to 6500 ft. | No | No | Yes |
| Prostrate bladderpod (Lesquerella prostrata) | Sparse communities on slopes and rims of clay & soft sandstones with fine gravel surface; 7,200 to 7,700 ft. | Yes | No | No |
| Trelease's milkvetch (Astragalus racemosus treleasei) | Sagebrush communities on shale or limestone outcrops or barren clay slopes; 6,500 to 8,200 ft. | Yes | No | No |

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[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table 1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued)

| **Common Name (scientific name)** | **Habitat** | **Kemmerer Field Office[1]** | **Rawlins Field Office[2]** | **Buffalo Field Office[3]** |
|---|---|---|---|---|
| Tufted twinpod (Physaria condensata) | Sparsely vegetated shale slopes and ridges; 6,500 to 7,000 ft. | Yes | No | No |
| Weber's scarlet gilia (Ipomopsis aggregata weberi) | Coniferous forest openings and scrub oak woodlands; 8,500 to 9,600 ft. | No | Yes | No |
| William's wafer parsnip (Cymopterus williamsii) | Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft. | No | No | Yes |

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

## STATE SPECIES OF SPECIAL CONCERN

The coal mining unsuitability criteria, which are listed in the federal coal management regulations at 43 CFR 3461, were applied to federal coal lands in Sheridan County in the early 1980s and in the mid 1990s by the BLM. The 1980s results were included in the 1985 *Buffalo Resource Area Resource Management Plan*. The results of the mid-1990s unsuitability criteria application are summarized in the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office*.

The unsuitability findings for the PSO Tract according to the 1985 *Buffalo Resource Area Resource Management Plan* and the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* are summarized in Appendix B of this DEIS. The 1985 findings for Criteria 14 and 15 are discussed in more detail below.

Portions of the PSO Tract totaling about 520 acres were found to be unsuitable for coal leasing and development under Criterion 14 (Habitat for Migratory Birds) when the unsuitability criteria were applied in the early 1980s. The designation was applied due to the presence of breeding habitat for the Lewis' woodpecker. This species is known to breed in the ponderosa pine habitat in the area of Ash Creek. BLM has reviewed this unsuitability finding and determined that Lewis' woodpeckers have been dropped from the list of "Migratory non-game birds of management concern in the U.S." BLM advised USFWS of their intent to drop the unsuitability designation for Lewis' woodpecker habitat under Criterion 14 within this area and to complete a land use plan maintenance action to reflect this. In a letter dated August 20, 2001, USFWS indicated their willingness to concur with the proposed change in unsuitability designation for Criterion 14; however, they requested that the scoria hillsides on the western edge of the exchange area be removed from the exchange. If those areas remain in the exchange tract, the USFWS will require monitoring of the Lewis' woodpecker as part of their mining permit (USFWS, 2001b).

The 1985 BLM *Buffalo Resource Area Resource Management Plan* found approximately 1,200 acres of federal coal to be unsuitable due to the presence of the Lewis' woodpecker under Criterion 15, Habitat for State High-Interest Species, and some of this acreage overlaps with the western edge of the PSO Tract. The WGFD submitted comments in response to the exchange notice identifying the Lewis' woodpecker as a state species of special concern that is found in the Ash Creek area in a letter dated January 30, 2001. In their comment letter, WGFD stated that they believe the exchange "will not significantly impact Lewis' woodpeckers, and that any concerns related to the Lewis' woodpecker could be adequately addressed during mine planning if active coal mining is proposed." When contacted, WGFD indicated that, due to the extent of their occurrence in

Wyoming, Lewis' woodpeckers are not considered rare or in need of management emphasis.

On October 24, 2001, the *Buffalo Resource Area Resource Management Plan* designation of a portion of the Sheridan Review Area as "unsuitable pending further study" for Lewis' Woodpecker habitat was removed in a plan maintenance action signed by the Field Office Manager.

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# APPENDIX D

SPECIFIC RESOURCE INFORMATION
FOR INDIVIDUAL P&M PARCELS WITHIN
THE BRIDGER-TETON NATIONAL FOREST

## SPECIFIC RESOURCE INFORMATION FOR INDIVIDUAL P&M PARCELS WITHIN THE BRIDGER-TETON NATIONAL FOREST

**East Fork of Hams Fork parcel,** approximately 280 acres, located in the Blacks Fork sub basin. This parcel has over one mile of perennial stream. A Colorado cutthroat trout (sensitive species) fishery exists in this creek. The majority of the parcel is lodgepole pine with some spruce and fir in the forested uplands. Willow and carex dominate the riparian area. The majority of the forested uplands have recently been partially harvested. A significant buffer strip of coniferous trees was left between the harvested area and the creek. It is nearly impossible to see the harvested area through this buffer strip while traveling along the creek. This buffer strip also reduced the likelihood of sediment from the road or from timber harvest activity from entering the creek. There is a single lane road (#10154) passing through this parcel from the northwest corner to the southeast corner. This road provides access to a large area including the headwaters of the East Fork, Pole Creek and Beaver Creek. Many suitable dispersed camping sites are located within this parcel, primarily along the creek but upland campsites exist as well.

**Elk Creek Guard Station parcel,** approximately 80 acres, located within the Blacks Fork sub basin. This parcel is located just southwest of the historic Elk Creek Guard Station cabin. The main stem of the Hams Fork river passes through the northeast corner of this parcel (approximately ¼ mile of the river) Colorado River cutthroat trout are suspected to occupy the streams within this parcel. This parcel contains approximately 1/5$^{th}$ riparian area, 2/5$^{th}$ coniferous forest, and 2/5$^{th}$ open sagebrush/grass vegetation types. Aspen is also a significant component of the vegetation types; it is dispersed within both the coniferous and the sagebrush/grass types. No harvest activity has taken place on this parcel. There has been no other development on this parcel that is known other than a faint trail that passes through the parcel from the West Fork Hams Fork Ridge Road (#10151) northeasterly toward the Elk Creek Guard Station historic cabin. There are remnants of an old access road across National Forest lands from road #10151 to the western side of the parcel. This road has naturally revegetated and is not open to motorized use. This parcel lends itself to non-motorized backcountry camping experience without being very far from a main road system.

**Shingle Mill Creek parcel**, approximately 240 acres, located within the Blacks Fork sub basin. This parcel lies between the South Fork of Elk Creek and Sawmill Creek, with the majority of the sub watershed draining into Shingle Mill Creek. Colorado River cutthroat trout are suspected to occupy the streams within this parcel. The majority of this parcel is lodgepole pine; spruce, fir and aspen are also present as well as small open patches of sagebrush and grass. There is approximately ½ mile of perennial and ephemeral streams crossing the parcel. The South Fork of Elk Creek bisects the northern most portion, and portions of

the Upper Shingle Mill Creek begins within this parcel. There are two access roads, the Shingle Mill Road (#10200) and the North Fork Sawmill Creek Road (#10158). The Shingle Mill Road accesses the northern portion of the parcel. This road is open seasonally and controlled by a locking gate near the Hams Fork Road (#10062). The North Fork of Sawmill Creek Road accesses the southwestern portion of this parcel. There is no seasonal closure on this road. The forested areas on this parcel have been partially harvested in recent years. There are many opportunities for dispersed camping within this parcel.

**North Fork of Elk Creek parcel,** approximately 320 acres, within the Blacks Fork sub basin. This parcel lies between Indian Creek and Elk Creek. Approximately 1/10$^{th}$ of a mile of the North Fork of Elk Creek passes through this parcel. Colorado River cutthroat trout are suspected to occupy the streams within this parcel. This parcel consists of a mosaic mix of coniferous forest, mostly lodgepole pine, aspen and sagebrush/grass. Accessible portions of the lodgepole have been partially harvested. Access to this parcel is via the Elk Creek Road (#10063). This road accesses the northern portion of the parcel and has traditionally been gated closed at the P&M property boundary during the wet periods. The Forest Service Closure is on the east side of the P&M parcel about ¾ road mile to the east. An old jeep trail used to access the southern tip of this parcel via the Shingle Mill Creek Road but this road has been abandoned and reclaimed and is no longer open to motorized use. This parcel has proven to be very productive for elk and deer hunters due to the patchy vegetation and rolling topography. Motorized and non-motorized users could have an outstanding recreational experience here.

**Rock Creek parcel**, approximately 80 acres within the Blacks Fork sub basin. This parcel is situated between the Hams Fork River and Middle Ridge. The parcel is primarily on a north-facing slope dominated by lodgepole pine, but with noticeable amounts of spruce, fir, aspen and a few patches of sagebrush/grass. The forested areas have been partially harvested; an access road was constructed within the parcel. This road has since been closed with earthen berms and with a gated closure. Access to the parcel across National Forest Lands is via road #10198. Due to the north aspect and lack of flat areas and riparian habitat, this parcel would not be expected to be used much by recreational campers although it is likely very valuable for big game hunting and habitat.

**Little Indian Creek parcel**, approximately 80 acres within the Blacks Fork sub basin. This parcel is situated just south of Little Indian Creek with a portion (1/8$^{th}$ mile) bisecting the parcel. Colorado River cutthroat trout are suspected to occupy the streams within this parcel. This parcel is mostly forested with a mixed conifer and aspen overstory, sub-alpine fir appears to be the dominant species. No harvest activity has been conducted on this parcel. Access is via the Indian Creek Road (#10161). This parcel is very suitable for dispersed camping, hiking and hunting.

**Green Knoll parcel**, approximately 560 acres within the Blacks Fork sub basin. This parcel lies between Middle Ridge and the Hams Fork River. Approximately ¾ mile of the Hams Fork River passes through this parcel. Colorado River cutthroat trout are known to occupy the streams within this parcel. The upland portions consist of a mosaic of coniferous forest, aspen and sagebrush grass. Approximately half of the forested areas have been partially harvested within the last few years. Several logging roads were created to access the timber; these have mostly been physically closed with earthen berms and downed trees. Access to this parcel is via road #10198. Dispersed camping and hunting opportunities are numerous in this parcel.

**Fontenelle Creek / Mahogany Ridge parcel**, approximately 800 acres within the Upper Green River sub basin. This parcel is located along the eastern boundary of the Bridger-Teton National Forest between Fontenelle Creek and the Fontenelle Hogbacks. Fontenelle Creek and Mahogany Creek pass through this large parcel, totaling approximately 1 mile of stream and associated riparian area. Fontenelle Creek is known to contain Colorado cutthroat trout. This parcel abuts BLM lands outside of the forest boundary in addition to other P&M property that the BLM would acquire under the proposed action. This would create a much more contiguous block of public land in an area that is very critical to wintering wildlife, and heavily used by big game hunters in the fall. Moose, elk and deer are known to use this area for winter forage. The dominant shrub, curlleaf mountainmahogany is very high in nutrition and the game uses it heavily, especially in harsh winters. This parcel also serves as a major migration corridor for wildlife passing from the forest to the shrub steppe. Mountain lions have been recorded frequenting this parcel as well. Sagebrush/grass, willow and conifer make up the remainder of the major vegetation types on this parcel. There has been no timber harvest on this parcel and there are no developed trails. Road access to this parcel is limited on the National Forest side (west) but there are some two-track roads accessing the property from private and BLM lands to the east.

# APPENDIX E

NON-MINE GROUNDWATER AND
SURFACE WATER RIGHTS
WITHIN THE PSO TRACT

**GROUNDWATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P87368W | 3/19/92 | 57N | 83W | 7 | NWNW | BARBULA**BERNICE E. TURLEY | HITSON #1 | UNA | STO | | 230 |
| P105303W | 3/24/97 | 57N | 83W | 7 | SWNW | JACQUELYN J MORELAND | J.J. #1 | UNA | DOM,STO | | 430 |
| P14351W | 6/14/72 | 57N | 84W | 1 | NENW | BERT STROUP | STROUP #1 | | STO,DOM | | 220 |
| P63785W | 4/21/83 | 57N | 84W | 1 | NENW | L. N. & S. A. DAVIS | DAVIS #2 | | DOM | | 82 |
| P34645W | 7/30/76 | 57N | 84W | 1 | NWSE | GEORGE BAKER | BAKER #1 | | STO,DOM | | |
| P97594W | 10/21/94 | 57N | 84W | 1 | NWSE | GEORGE OR ALICE BAKER | BAKER #2 | UNA | DOM | | |
| P90816W | 2/4/93 | 57N | 84W | 1 | SWSW | INTERTRIBAL ADDICTIONS RECOVERY | THUNDER CHILD #1 | UNA | MIS | | 40 |
| P35606W | 11/30/76 | 57N | 84W | 3 | SWSW | FLYING V CATTLE COMPANY | MINE #2 | | STO,DOM | | |
| P97471W | 10/10/94 | 57N | 84W | 4 | SWSE | BIG HORN COAL COMPANY | P5 STOCK WELL | A&C | STO | | |
| P59067W | 12/7/81 | 57N | 84W | 4 | SENW | Chevron USA Inc. | MIKE-1 | | STO | 2 | 200 |
| P74114W | 2/26/87 | 57N | 84W | 5 | NENW | FLYING V CATTLE COMPANY | FLYING V #7 | | STO | | 235 |
| P33064W | 5/7/76 | 57N | 84W | 9 | NWNW | JAY R. HUTTON | HUTTON #1 | | DOM | | 174 |
| P48251W | 5/23/79 | 57N | 84W | 9 | SENE | FLYING V CATTLE CO | PADLOCK WW (BH429) | | STO | | 265 |
| P98281W | 2/7/95 | 57N | 84W | 10 | SENW | BIG HORN COAL COMPANY | P5 STOCK WELL #1 | UNA | STO | | 290 |
| P25682P | 1/25/74 | 57N | 84W | 11 | NESE | CLARENCE W. TERRY | SCHREIBEIS #2 | | STO | | |
| P25681P | 1/25/74 | 57N | 84W | 11 | SESE | CLARENCE W. TERRY | SCHREIBEIS #1 | | DOM | | |
| P18702P | 12/31/09 | 57N | 84W | 11 | SESW | BARBARA CHERNI | BARBARA CHERNI #1 | | DOM | | |
| P18703P | 12/31/54 | 57N | 84W | 11 | SESW | BARBARA CHERNI | BARBARA CHERNI #2 | | DOM | | |
| P18704P | 12/31/54 | 57N | 84W | 11 | SESW | BARBARA CHERNI | BARBARA CHERNI #3 | | STO | | |
| P94647W | 3/2/94 | 57N | 84W | 12 | NENE | LOREN D. MINEAR | MINEAR #1 | UNA | DOM | | 410 |
| P5493W | 5/12/70 | 57N | 84W | 12 | NENW | WILLIAM J. EISELE | EISELE #1 | | STO | | 160 |
| P34899W | 8/24/76 | 57N | 84W | 12 | NENW | GERALD W. MORAVEK | MORAVEK #1 | | STO,DOM | | 50 |
| P34900W | 8/24/76 | 57N | 84W | 12 | NENW | GERALD MORAVEK | MORAVEK #2 | | STO,DOM | | |
| P34901W | 8/24/76 | 57N | 84W | 12 | NWNE | GERALD W. MORAVEK | MORAVEK #3 | UNA | STO,DOM | | |
| P34902W | 8/24/76 | 57N | 84W | 12 | SWNE | GERALD W. MORAVEK | MORAVEK #4 | | DOM | | |
| P18668P | 12/31/35 | 57N | 84W | 12 | SWSE | DEAN MCCLURE | MCCLURE #1 SHERIDAN | | STO,DOM | | |
| P26850W | 5/31/74 | 57N | 84W | 12 | SWSE | HAROLD L. RILEY | RILEY #1 | | STO | | 123 |
| P18669P | 12/31/35 | 57N | 84W | 12 | SWSE | DEAN MCCLURE | MCCLURE #2 SHERIDAN | | STO | | |
| P74594W | 5/5/87 | 57N | 84W | 12 | SWSE | ROBERT W. MOREL**SHANE D. MOREL | MOREL S1 | | STO,DOM | | 260 |
| P91876W | 6/1/93 | 57N | 84W | 14 | SENE | MICHAEL AND SUSAN TERRY | TERRY #1 | UNA | DOM,STO | | 30 |
| P111433W | 8/17/98 | 58N | 83W | 19 | NENE | REDSTONE RESOURCES, INC. | FT UNION 41D-1983 | UNA | STO,CBM | | |
| P127442W | 7/7/00 | 58N | 83W | 19 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41C-1983 | UNA | STO,CBM | | |
| P127443W | 7/7/00 | 58N | 83W | 19 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41D2/3-1983 | UNA | STO,CBM | | |
| P127444W | 7/7/00 | 58N | 83W | 19 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41M-1983 | UNA | STO,CBM | | |
| P127427W | 7/7/00 | 58N | 83W | 19 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21C-1983 | UNA | STO,CBM | | |
| P127428W | 7/7/00 | 58N | 83W | 19 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D1-1983 | UNA | STO,CBM | | |
| P127429W | 7/7/00 | 58N | 83W | 19 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D2/3-1983 | UNA | STO,CBM | | |
| P127430W | 7/7/00 | 58N | 83W | 19 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21M-1983 | UNA | STO,CBM | | |
| P127446W | 7/7/00 | 58N | 83W | 19 | NESE | REDSTONE GAS PARTNERS LLC | CHEVRON 43D1-1983 | UNA | STO,CBM | | |
| P127445W | 7/7/00 | 58N | 83W | 19 | NESE | REDSTONE GAS PARTNERS LLC | CHEVRON 43C-1983 | UNA | STO,CBM | | |
| P127447W | 7/7/00 | 58N | 83W | 19 | NESE | REDSTONE GAS PARTNERS LLC | CHEVRON 43D2/3-1983 | UNA | STO,CBM | 300 | |
| P127432W | 7/7/00 | 58N | 83W | 19 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23D1-1983 | UNA | STO,CBM | 350 | |
| P127434W | 7/7/00 | 58N | 83W | 19 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23M-1983 | UNA | STO,CBM | | |

**GROUNDWATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
|---|---|---|---|---|---|---|---|---|---|---|---|

| GROUNDWATER RIGHTS - WYOMING | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
| P127431W | 7/7/00 | 58N | 83W | 19 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23C-1983 | UNA | STO,CBM | | |
| P127433W | 7/7/00 | 58N | 83W | 19 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23D2/3-1983 | UNA | STO,CBM | | |
| P111432W | 8/17/98 | 58N | 83W | 19 | SWNE | REDSTONE RESOURCES, INC. | FT UNION 32D-1983 | UNA | STO,CBM | | |
| P127435W | 7/7/00 | 58N | 83W | 19 | SWNE | REDSTONE GAS PARTNERS LLC | CHEVRON 32C-1983 | UNA | STO,CBM | | |
| P127436W | 7/7/00 | 58N | 83W | 19 | SWNE | REDSTONE GAS PARTNERS LLC | CHEVRON 32D2/3-1983 | UNA | STO,CBM | | |
| P127437W | 7/7/00 | 58N | 83W | 19 | SWNE | REDSTONE GAS PARTNERS LLC | CHEVRON 32M-1983 | UNA | STO,CBM | | |
| P30374W | 6/30/75 | 58N | 83W | 19 | SWSE | CHEVRON USA INC. | BT #5 | | STO | | |
| P32672W | 4/1/76 | 58N | 83W | 19 | SWSE | CHEVRON USA INC. | BT 10 | | STO | | 277 |
| P127439W | 7/7/00 | 58N | 83W | 19 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34D1-1983 | UNA | STO,CBM | | |
| P127438W | 7/7/00 | 58N | 83W | 19 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34C-1983 | UNA | STO,CBM | | |
| P127441W | 7/7/00 | 58N | 83W | 19 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34M-1983 | UNA | STO,CBM | | |
| P127440W | 7/7/00 | 58N | 83W | 19 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34D2/3-1983 | UNA | STO,CBM | | |
| P130412W | 10/23/00 | 58N | 83W | 19 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12C-1983 | UNA | STO,CBM | | |
| P130413W | 10/23/00 | 58N | 83W | 19 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12D1-1983 | UNA | STO,CBM | | |
| P130414W | 10/23/00 | 58N | 83W | 19 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12D2/3-1983 | UNA | STO,CBM | | |
| P130415W | 10/23/00 | 58N | 83W | 19 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12M-1983 | UNA | STO,CBM | | |
| P130416W | 10/23/00 | 58N | 83W | 19 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14C-1983 | UNA | STO,CBM | | |
| P130417W | 10/23/00 | 58N | 83W | 19 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14D1-1983 | UNA | STO,CBM | | |
| P130418W | 10/23/00 | 58N | 83W | 19 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14D2/3-1983 | UNA | STO,CBM | | |
| P130419W | 10/23/00 | 58N | 83W | 19 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14M-1983 | UNA | STO,CBM | | |
| P128039W | 7/31/00 | 58N | 83W | 20 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D2/3-2083 | UNA | STO,CBM | | |
| P128040W | 7/31/00 | 58N | 83W | 20 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21M-2083 | UNA | STO,CBM | | |
| P128037W | 7/31/00 | 58N | 83W | 20 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21C-2083 | UNA | STO,CBM | | |
| P128038W | 7/31/00 | 58N | 83W | 20 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D1-2083 | UNA | STO,CBM | | |
| P128043W | 7/31/00 | 58N | 83W | 20 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23D2/3-2083 | UNA | STO,CBM | | |
| P128041W | 7/31/00 | 58N | 83W | 20 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23C-2083 | UNA | STO,CBM | | |
| P128044W | 7/31/00 | 58N | 83W | 20 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23M-2083 | UNA | STO,CBM | | |
| P128042W | 7/31/00 | 58N | 83W | 20 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23D1-2083 | UNA | STO,CBM | | |
| P111430W | 8/17/98 | 58N | 83W | 20 | NWNW | REDSTONE RESOURCES, INC. | FT UNION 11D-2083 | CAN | STO,CBM | | |
| P128031W | 7/31/00 | 58N | 83W | 20 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12D2/3-2083 | UNA | STO,CBM | | |
| P128030W | 7/31/00 | 58N | 83W | 20 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12D1-2083 | UNA | STO,CBM | | |
| P128029W | 7/31/00 | 58N | 83W | 20 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12C-2083 | UNA | STO,CBM | | |
| P128032W | 7/31/00 | 58N | 83W | 20 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12M-2083 | UNA | STO,CBM | | |
| P128036W | 7/31/00 | 58N | 83W | 20 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14M-2083 | UNA | STO,CBM | | |
| P128035W | 7/31/00 | 58N | 83W | 20 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14D2/3-2083 | UNA | STO,CBM | | |
| P128034W | 7/31/00 | 58N | 83W | 20 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14D1-2083 | UNA | STO,CBM | | |
| P128033W | 7/31/00 | 58N | 83W | 20 | SWSW | REDSTONE GAS PARTNERS LLC | CHEVRON 14C-2083 | UNA | STO,CBM | | |
| P112488W | 10/28/98 | 58N | 83W | 30 | NENE | FOREST/SUSAN DUNNING | DUNNING HOME #1 | UNA | DOM | | |
| P130260W | 8/1/00 | 58N | 83W | 30 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21M-3083 | UNA | STO,CBM | | |
| P130272W | 8/1/00 | 58N | 83W | 30 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21C-3183 | UNA | STO,CBM | | |
| P112487W | 10/28/98 | 58N | 83W | 30 | NESE | FOREST/SUSAN DUNNING | DUNNING BARN #1 | UNA | DOM,STO | | 37 |
| P124878W | 4/17/00 | 58N | 83W | 30 | NESE | FOREST/SUSAN DUNNING | DUNNING HOME #2 | UNA | STO | | |
| P130263W | 8/1/00 | 58N | 83W | 30 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23D2/3-3083 | UNA | STO,CBM | | |

**GROUNDWATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P130262W | 8/1/00 | 58N | 83W | 30 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23D1-3083 | UNA | STO,CBM | | |
| P130264W | 8/1/00 | 58N | 83W | 30 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23M-3083 | UNA | STO,CBM | | |
| P130261W | 8/1/00 | 58N | 83W | 30 | NESW | REDSTONE GAS PARTNERS LLC | CHEVRON 23C-3083 | UNA | STO,CBM | | |
| P116932W | 7/11/99 | 58N | 83W | 30 | SWNE | THE PITSBURG & MIDWAY COAL MINING CO | P & M #1 | UNA | DOM,STO | | 40 |
| P30370W | 6/30/75 | 58N | 83W | 30 | SWNE | CHEVRON USA INC. | BT #1 | A&C | STO,DOM | | |
| P130265W | 8/1/00 | 58N | 83W | 30 | SWNE | REDSTONE GAS PARTNERS LLC | CHEVRON 32C-3083 | UNA | STO,CBM | | |
| P30371W | 6/30/75 | 58N | 83W | 30 | SWNE | FORT UNION LTD. | BT #2 | UNA | STO,DOM | 5 | 15 |
| P130267W | 8/1/00 | 58N | 83W | 30 | SWNE | REDSTONE GAS PARTNERS LLC | CHEVRON 32M-3083 | UNA | STO,CBM | | |
| P130266W | 8/1/00 | 58N | 83W | 30 | SWNE | REDSTONE GAS PARTNERS LLC | CHEVRON 32D2/3-3083 | UNA | STO,CBM | | |
| P130258W | 8/1/00 | 58N | 83W | 30 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D1-3083 | UNA | STO,CBM | | |
| P130259W | 8/1/00 | 58N | 83W | 30 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D2/3-3083 | UNA | STO,CBM | | |
| P130257W | 8/1/00 | 58N | 83W | 30 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 21C-3083 | UNA | STO,CBM | | |
| P128415W | 8/21/00 | 58N | 83W | 30 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12C-3083 | UNA | STO,CBM | | |
| P128416W | 8/21/00 | 58N | 83W | 30 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12D2/3-3083 | UNA | STO,CBM | | |
| P128417W | 8/21/00 | 58N | 83W | 30 | SWNW | REDSTONE GAS PARTNERS LLC | CHEVRON 12M-3083 | UNA | STO,CBM | | |
| P130271W | 8/1/00 | 58N | 83W | 30 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34M-3083 | UNA | STO,CBM | | |
| P130270W | 8/1/00 | 58N | 83W | 30 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34D2/3-3083 | UNA | STO,CBM | | |
| P130268W | 8/1/00 | 58N | 83W | 30 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34C-3083 | UNA | STO,CBM | | |
| P130269W | 8/1/00 | 58N | 83W | 30 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34D1-3083 | UNA | STO,CBM | | |
| P130273W | 8/1/00 | 58N | 83W | 31 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21D2/3-3183 | UNA | STO,CBM | | |
| P130274W | 8/1/00 | 58N | 83W | 31 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21M-3183 | UNA | STO,CBM | | |
| P16948P | 7/20/60 | 58N | 84W | 19 | NESE | J. VERNON STATES | BAKER #1 | | STO | 3 | Unk |
| P16946P | 8/25/58 | 58N | 84W | 20 | SENW | J. VERNON STATES | BOB. HERLAND #1 | | STO | 25 | 3 |
| P127905W | 8/3/00 | 58N | 84W | 22 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43M-2284 | UNA | STO,CBM | | |
| P127904W | 8/3/00 | 58N | 84W | 22 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43C-2284 | UNA | STO,CBM | | |
| P127902W | 8/3/00 | 58N | 84W | 22 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34C-2284 | UNA | STO,CBM | | |
| P127903W | 8/3/00 | 58N | 84W | 22 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34M-2284 | UNA | STO,CBM | | |
| P125340W | 5/5/00 | 58N | 84W | 23 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41C-2384 | UNA | STO,CBM | | |
| P125342W | 5/5/00 | 58N | 84W | 23 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41M-2384 | UNA | STO,CBM | | |
| P125341W | 5/5/00 | 58N | 84W | 23 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41D2/3-2384 | UNA | STO,CBM | | |
| P125335W | 5/5/00 | 58N | 84W | 23 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21D-2384 | UNA | STO,CBM | | |
| P125336W | 5/5/00 | 58N | 84W | 23 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21M-2384 | UNA | STO,CBM | | |
| P125334W | 5/5/00 | 58N | 84W | 23 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21C-2384 | UNA | STO,CBM | | |
| P125343W | 5/5/00 | 58N | 84W | 23 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43C-2384 | UNA | STO,CBM | | |
| P125345W | 5/5/00 | 58N | 84W | 23 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43M-2384 | UNA | STO,CBM | | |
| P125344W | 5/5/00 | 58N | 84W | 23 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43D2/3-2384 | UNA | STO,CBM | | |
| P126826W | 7/3/00 | 58N | 84W | 23 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43D1-2384 | UNA | STO,CBM | | |
| P126821W | 7/3/00 | 58N | 84W | 23 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23D-2384 | UNA | STO,CBM | | |
| P126820W | 7/3/00 | 58N | 84W | 23 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23C-2384 | UNA | STO,CBM | | |
| P126822W | 7/3/00 | 58N | 84W | 23 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23M-2384 | UNA | STO,CBM | | |

| GROUNDWATER RIGHTS - WYOMING | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
| P126824W | 7/3/00 | 58N | 84W | 23 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32D-2384 | UNA | STO,CBM | | |
| P126823W | 7/3/00 | 58N | 84W | 23 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32C-2384 | UNA | STO,CBM | | |
| P126825W | 7/3/00 | 58N | 84W | 23 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32M-2384 | UNA | STO,CBM | | |
| P125330W | 5/5/00 | 58N | 84W | 23 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12M-2384 | UNA | STO,CBM | | |
| P125328W | 5/5/00 | 58N | 84W | 23 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12C-2384 | UNA | STO,CBM | | |
| P125329W | 5/5/00 | 58N | 84W | 23 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12D-2384 | UNA | STO,CBM | | |
| P125337W | 5/5/00 | 58N | 84W | 23 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34C-2384 | UNA | STO,CBM | | |
| P125338W | 5/5/00 | 58N | 84W | 23 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34D2/3-2384 | UNA | STO,CBM | | |
| P125339W | 5/5/00 | 58N | 84W | 23 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34M-2384 | UNA | STO,CBM | | |
| P125333W | 5/5/00 | 58N | 84W | 23 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14M-2384 | UNA | STO,CBM | | |
| P125332W | 5/5/00 | 58N | 84W | 23 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14D-2384 | UNA | STO,CBM | | |
| P125331W | 5/5/00 | 58N | 84W | 23 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14C-2384 | UNA | STO,CBM | | |
| P130424W | 10/23/00 | 58N | 84W | 23 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41D1-2384 | UNA | STO,CBM | | |
| P126847W | 7/3/00 | 58N | 84W | 24 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41M-2484 | UNA | STO,CBM | | |
| P126845W | 7/3/00 | 58N | 84W | 24 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41D1-2484 | UNA | STO,CBM | | |
| P126844W | 7/3/00 | 58N | 84W | 24 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41C-2484 | UNA | STO,CBM | | |
| P126846W | 7/3/00 | 58N | 84W | 24 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41D2/3-2484 | UNA | STO,CBM | | |
| P126833W | 7/3/00 | 58N | 84W | 24 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21C-2484 | UNA | STO,CBM | | |
| P126834W | 7/3/00 | 58N | 84W | 24 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21D2/3-2484 | UNA | STO,CBM | | |
| P126835W | 7/3/00 | 58N | 84W | 24 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21M-2484 | UNA | STO,CBM | | |
| P126850W | 7/3/00 | 58N | 84W | 24 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43D2/3-2484 | UNA | STO,CBM | | |
| P126849W | 7/3/00 | 58N | 84W | 24 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43C1-2484 | UNA | STO,CBM | | |
| P126848W | 7/3/00 | 58N | 84W | 24 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43C-2484 | UNA | STO,CBM | | |
| P126851W | 7/3/00 | 58N | 84W | 24 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43M-2484 | UNA | STO,CBM | | |
| P126836W | 7/3/00 | 58N | 84W | 24 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23C-2484 | UNA | STO,CBM | | |
| P126837W | 7/3/00 | 58N | 84W | 24 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23D2/3-2484 | UNA | STO,CBM | | |
| P126838W | 7/3/00 | 58N | 84W | 24 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23M-2484 | UNA | STO,CBM | | |
| P126839W | 7/3/00 | 58N | 84W | 24 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32C-2484 | UNA | STO,CBM | | |
| P126841W | 7/3/00 | 58N | 84W | 24 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32M-2484 | UNA | STO,CBM | | |
| P126840W | 7/3/00 | 58N | 84W | 24 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32D2/3-2484 | UNA | STO,CBM | | |
| P126828W | 7/3/00 | 58N | 84W | 24 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12M-2484 | UNA | STO,CBM | | |
| P126827W | 7/3/00 | 58N | 84W | 24 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12C-2484 | UNA | STO,CBM | | |
| P126855W | 7/3/00 | 58N | 84W | 24 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12D2/3-2484 | UNA | STO,CBM | | |
| P126856W | 7/3/00 | 58N | 84W | 24 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34D2/3-2484 | UNA | STO,CBM | | |
| P126843W | 7/3/00 | 58N | 84W | 24 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34M-2484 | UNA | STO,CBM | | |
| P126842W | 7/3/00 | 58N | 84W | 24 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34C-2484 | UNA | STO,CBM | | |
| P126829W | 7/3/00 | 58N | 84W | 24 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14C-2484 | UNA | STO,CBM | | |
| P126830W | 7/3/00 | 58N | 84W | 24 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14D1-2484 | UNA | STO,CBM | | |
| P126832W | 7/3/00 | 58N | 84W | 24 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14M-2484 | UNA | STO,CBM | | |
| P126831W | 7/3/00 | 58N | 84W | 24 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14D2/3-2484 | UNA | STO,CBM | | |
| P123717W | 2/24/00 | 58N | 84W | 25 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41M-2584 | UNA | STO,CBM | | |
| P123715W | 2/24/00 | 58N | 84W | 25 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41C-2584 | UNA | STO,CBM | | |
| P123716W | 2/24/00 | 58N | 84W | 25 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41D2/3-2584 | UNA | STO,CBM | | 332.5 |

| GROUNDWATER RIGHTS - WYOMING | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
| P123704W | 2/24/00 | 58N | 84W | 25 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21D2/3-2584 | UNA | STO,CBM | | |
| P123705W | 2/24/00 | 58N | 84W | 25 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21M-2584 | UNA | STO,CBM | | 424 |
| P123703W | 2/24/00 | 58N | 84W | 25 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21C-2584 | UNA | STO,CBM | | |
| P126852W | 7/3/00 | 58N | 84W | 25 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21D1-2584 | UNA | STO,CBM | | |
| P123719W | 2/24/00 | 58N | 84W | 25 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43D2/3-2584 | UNA | STO,CBM | | |
| P123718W | 2/24/00 | 58N | 84W | 25 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43C-2584 | UNA | STO,CBM | | 654 |
| P123720W | 2/24/00 | 58N | 84W | 25 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43M-2584 | UNA | STO,CBM | | 471 |
| P126854W | 7/3/00 | 58N | 84W | 25 | NESE | REDSTONE GAS PARTNERS LLC | RESERVE 43D1-2584 | UNA | STO,CBM | | |
| P123708W | 2/24/00 | 58N | 84W | 25 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23M-2584 | UNA | STO,CBM | | 494.5 |
| P123706W | 2/24/00 | 58N | 84W | 25 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23C-2584 | UNA | STO,CBM | | |
| P123707W | 2/24/00 | 58N | 84W | 25 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23D2/3-2584 | UNA | STO,CBM | | 369 |
| P123710W | 2/24/00 | 58N | 84W | 25 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32D2/3-2584 | UNA | STO,CBM | | 312.5 |
| P123709W | 2/24/00 | 58N | 84W | 25 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32C-2584 | UNA | STO,CBM | | |
| P123711W | 2/24/00 | 58N | 84W | 25 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32M-2584 | UNA | STO,CBM | | 416.5 |
| P126853W | 7/3/00 | 58N | 84W | 25 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32D1-2584 | UNA | STO,CBM | | |
| P123697W | 2/24/00 | 58N | 84W | 25 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12C-2584 | UNA | STO,CBM | | |
| P123698W | 2/24/00 | 58N | 84W | 25 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12D2/3-2584 | UNA | STO,CBM | | |
| P123699W | 2/24/00 | 58N | 84W | 25 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12M-2584 | UNA | STO,CBM | | |
| P123714W | 2/24/00 | 58N | 84W | 25 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34M-2584 | UNA | STO,CBM | | 501 |
| P123713W | 2/24/00 | 58N | 84W | 25 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34D2/3-2584 | UNA | STO,CBM | | 381.5 |
| P123712W | 2/24/00 | 58N | 84W | 25 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34C-2584 | UNA | STO,CBM | | |
| P123700W | 2/24/00 | 58N | 84W | 25 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14C-2584 | UNA | STO,CBM | | |
| P123702W | 2/24/00 | 58N | 84W | 25 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14M-2584 | UNA | STO,CBM | | |
| P123701W | 2/24/00 | 58N | 84W | 25 | SWSW | REDSTONE GAS PARTNERS LLC | RESERVE 14D2/3-2584 | UNA | STO,CBM | | 322 |
| P123735W | 2/24/00 | 58N | 84W | 26 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41M-2684 | UNA | STO,CBM | | |
| P123733W | 2/24/00 | 58N | 84W | 26 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41C-2684 | UNA | STO,CBM | | |
| P123734W | 2/24/00 | 58N | 84W | 26 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41D2/3-2684 | UNA | STO,CBM | | |
| P125980W | 5/23/00 | 58N | 84W | 26 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21C-2684 | UNA | STO,CBM | | |
| P125979W | 5/23/00 | 58N | 84W | 26 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21D2/3-2684 | UNA | STO,CBM | | |
| P125978W | 5/23/00 | 58N | 84W | 26 | NENW | REDSTONE GAS PARTNERS LLC | RESERVE 21M-2684 | UNA | STO,CBM | | |
| P123726W | 2/24/00 | 58N | 84W | 26 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23M-2684 | UNA | STO,CBM | | |
| P123725W | 2/24/00 | 58N | 84W | 26 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23D2/3-2684 | UNA | STO,CBM | | |
| P123724W | 2/24/00 | 58N | 84W | 26 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23C-2684 | UNA | STO,CBM | | |
| P123727W | 2/24/00 | 58N | 84W | 26 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32C-2684 | UNA | STO,CBM | | |
| P123729W | 2/24/00 | 58N | 84W | 26 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32M-2684 | UNA | STO,CBM | | |
| P123728W | 2/24/00 | 58N | 84W | 26 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32D2/3-2684 | UNA | STO,CBM | | |
| P125988W | 5/23/00 | 58N | 84W | 26 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12D2/3-2684 | UNA | STO,CBM | | |
| P125987W | 5/23/00 | 58N | 84W | 26 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12C-2684 | UNA | STO,CBM | | |
| P125981W | 5/23/00 | 58N | 84W | 26 | SWNW | REDSTONE GAS PARTNERS LLC | RESERVE 12M-2684 | UNA | STO,CBM | | |
| P123731W | 2/24/00 | 58N | 84W | 26 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34D2/3-2684 | UNA | STO,CBM | | |
| P123730W | 2/24/00 | 58N | 84W | 26 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34C-2684 | UNA | STO,CBM | | |
| P123732W | 2/24/00 | 58N | 84W | 26 | SWSE | REDSTONE GAS PARTNERS LLC | RESERVE 34M-2684 | UNA | STO,CBM | | |
| P123723W | 2/24/00 | 58N | 84W | 26 | SWSW | REDSTONE GAS PARTNERS LLC | SHELL 14M-2684 | UNA | STO,CBM | | |

**GROUNDWATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Yld Act | T.D. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P123721W | 2/24/00 | 58N | 84W | 26 | SWSW | REDSTONE GAS PARTNERS LLC | SHELL 14C-2684 | UNA | STO,CBM | | |
| P123722W | 2/24/00 | 58N | 84W | 26 | SWSW | REDSTONE GAS PARTNERS LLC | SHELL 14D2/3-2684 | UNA | STO,CBM | | |
| P123747W | 2/24/00 | 58N | 84W | 27 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41M-2784 | UNA | STO,CBM | | |
| P123746W | 2/24/00 | 58N | 84W | 27 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41D2/3-2784 | UNA | STO,CBM | | |
| P123744W | 2/24/00 | 58N | 84W | 27 | NENE | REDSTONE GAS PARTNERS LLC | RESERVE 41C-2784 | UNA | STO,CBM | | |
| P123749W | 2/24/00 | 58N | 84W | 27 | NESE | REDSTONE GAS PARTNERS LLC | SHELL 43D2/3-2784 | UNA | STO,CBM | | |
| P123750W | 2/24/00 | 58N | 84W | 27 | NESE | REDSTONE GAS PARTNERS LLC | SHELL 43M-2784 | UNA | STO,CBM | | |
| P123748W | 2/24/00 | 58N | 84W | 27 | NESE | REDSTONE GAS PARTNERS LLC | SHELL 43C-2784 | UNA | STO,CBM | | |
| P123737W | 2/24/00 | 58N | 84W | 27 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23D2/3-2784 | UNA | STO,CBM | | |
| P123738W | 2/24/00 | 58N | 84W | 27 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23M-2784 | UNA | STO,CBM | | |
| P123736W | 2/24/00 | 58N | 84W | 27 | NESW | REDSTONE GAS PARTNERS LLC | RESERVE 23C-2784 | UNA | STO,CBM | | |
| P123740W | 2/24/00 | 58N | 84W | 27 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32D2/3-2784 | UNA | STO,CBM | | |
| P123739W | 2/24/00 | 58N | 84W | 27 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32C-2784 | UNA | STO,CBM | | |
| P123741W | 2/24/00 | 58N | 84W | 27 | SWNE | REDSTONE GAS PARTNERS LLC | RESERVE 32M-2784 | UNA | STO,CBM | | |
| P123745W | 2/24/00 | 58N | 84W | 27 | SWSE | REDSTONE GAS PARTNERS LLC | DELAPP 34M-2784 | UNA | STO,CBM | | |
| P123743W | 2/24/00 | 58N | 84W | 27 | SWSE | REDSTONE GAS PARTNERS LLC | DELAPP 34D2/3-2784 | UNA | STO,CBM | | |
| P123742W | 2/24/00 | 58N | 84W | 27 | SWSE | REDSTONE GAS PARTNERS LLC | DELAPP 34C-2784 | UNA | STO,CBM | | |
| P130516W | 10/24/00 | 58N | 84W | 27 | SWSW | REDSTONE GAS PARTNERS LLC | DELAPP 14C-2784 | UNA | STO,CBM | | |
| P130815W | 11/9/00 | 58N | 84W | 28 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34C-2884 | UNA | STO,CBM | | |
| P130816W | 11/9/00 | 58N | 84W | 28 | SWSE | REDSTONE GAS PARTNERS LLC | CHEVRON 34M-2884 | UNA | STO,CBM | | |
| P130817W | 11/9/00 | 58N | 84W | 28 | NESE | REDSTONE GAS PARTNERS LLC | CHEVRON 43C-2884 | UNA | STO,CBM | | |
| P130818W | 11/9/00 | 58N | 84W | 28 | NESE | REDSTONE GAS PARTNERS LLC | CHEVRON 43M-2884 | UNA | STO,CBM | | |
| P16944P | 8/15/60 | 58N | 84W | 28 | SENE | J. VERNON STATES | STATES #3 | | STO | 13 | 380 |
| P16942P | 5/15/54 | 58N | 84W | 29 | SESW | J. VERNON STATES | STATES #1 | | STO | 15 | 150 |
| P16943P | 7/10/61 | 58N | 84W | 29 | NESW | J. VERNON STATES | STATES #2 | | DOM | 5 | 175 |
| P16945P | 9/25/61 | 58N | 84W | 29 | SESW | J. VERNON STATES | STATES #4 | | STO | 5 | 1200 |
| P16947P | 9/10/54 | 58N | 84W | 29 | NESE | J. VERNON STATES | DEBSKI #1 | | STO | 3 | UNK |
| P57094W | 5/20/81 | 58N | 84W | 30 | SWSE | GEORGE BUSZKIEWIC | VANATTA #1 | | DOM | 10 | 80 |
| P100385W | 9/21/95 | 58N | 84W | 33 | NWNW | FRANK/MARY MOMMSEN | FM #1 | UNA | DOM | 8 | 60 |
| P130819W | 11/9/00 | 58N | 84W | 34 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21C-3484 | UNA | STO,CBM | | |
| P130820W | 11/9/00 | 58N | 84W | 34 | NENW | REDSTONE GAS PARTNERS LLC | CHEVRON 21M-3484 | UNA | STO,CBM | | |
| P130821W | 11/9/00 | 58N | 84W | 34 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41C-3484 | UNA | STO,CBM | | |
| P130822W | 11/9/00 | 58N | 84W | 34 | NENE | REDSTONE GAS PARTNERS LLC | CHEVRON 41M-3484 | UNA | STO,CBM | | |
| P130823W | 11/9/00 | 58N | 84W | 35 | NENW | REDSTONE GAS PARTNERS LLC | DELAPP 21C-3584 | UNA | STO,CBM | | |
| P130824W | 11/9/00 | 58N | 84W | 35 | NENW | REDSTONE GAS PARTNERS LLC | DELAPP 21D1-3584 | UNA | STO,CBM | | |
| P130825W | 11/9/00 | 58N | 84W | 35 | NENW | REDSTONE GAS PARTNERS LLC | DELAPP 21M-3584 | UNA | STO,CBM | | |
| P20042P | 12/31/21 | 58N | 84W | 35 | SWNW | HOWARD JORGENSON | JORGENSON #4 | UNA | STO,DOM | 25 | 200 |
| P118193W | 8/9/99 | 58N | 84W | 36 | NENE | J.M. HUBER CORPORATION | HUBER-DELAPP 1-36-58-84 | UNA | STO,CBM | | |
| P118796W | 9/16/99 | 58N | 84W | 36 | NENW | J.M. HUBER CORPORATION | HUBER-DELAPP 3-36-58-84 | UNA | CBM | | |
| P118198W | 8/9/99 | 58N | 84W | 36 | NESE | J.M. HUBER CORPORATION | HUBER-DELAPP 9-36-58-84 | UNA | STO,CBM | | |
| P118798W | 9/16/99 | 58N | 84W | 36 | NESW | J.M. HUBER CORPORATION | HUBER-DELAPP 11-36-58-84 | UNA | CBM | | |
| P118194W | 8/9/99 | 58N | 84W | 36 | NWNE | J.M. HUBER CORPORATION | HUBER-DELAPP 2-36-58-84 | UNA | STO,CBM | | |
| P118797W | 9/16/99 | 58N | 84W | 36 | NWSE | J.M. HUBER CORPORATION | HUBER-DELAPP 10-36-58-84 | UNA | CBM | | |

| GROUNDWATER RIGHTS - WYOMING | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Permit No.** | **Priority** | **Tns** | **Rng** | **Sec** | **qq** | **Applicant** | **Facility Name** | **Status** | **Uses** | **Yld Act** | **T.D.** |
| P118197W | 8/9/99 | 58N | 84W | 36 | SENE | J.M. HUBER CORPORATION | HUBER-DELAPP 8-36-58-84 | UNA | STO,CBM | | |
| P118195W | 8/9/99 | 58N | 84W | 36 | SENW | J.M. HUBER CORPORATION | HUBER-DELAPP 6-36-58-84 | UNA | STO,CBM | | |
| P118196W | 8/9/99 | 58N | 84W | 36 | SWNE | J.M. HUBER CORPORATION | HUBER-DELAPP 7-36-58-84 | UNA | STO,CBM | | |
| P5490W | 5/12/70 | 58N | 84W | 36 | SWSE | RALPH DELAPP | DELAPP #2 | | STO,DOM | 15 | 50 |
| P18214P | 8/1/11 | 58N | 85W | 23 | SWSE | WALTER R/PARTICIA ANN BAKER | SCHOOL HOUSE #1 | UNA | STO | | |
| P113528W | 1/13/99 | 58N | 85W | 24 | NWSE | ANNA LOU RANDAL | ANNA #2 | UNA | STO | | 0 |
| P113527W | 1/13/99 | 58N | 85W | 24 | SWSE | ANNA LOU RANDAL | ANNA #1 | UNA | STO | | 0 |
| **GROUNDWATER RIGHTS - MONTANA** | | | | | | | | | | | |
| **Permit No.** | **Priority** | **Tns** | **Rng** | **Sec** | **qq** | **Applicant** | **Facility Name** | **Status** | **Uses** | **Yld Act** | **T.D.** |
| W038277-00 | | 09S | 38E | 25 | NESWNW | COLLENE M. BURTON | PLUM CK SPRING | | STO | 10 | |
| C003994-00 | 1974 | 09S | 39E | 21 | SESE | VERNON J. STATES | WELL | | STO | 6 | 615 |
| C039193-00 | 1981 | 09S | 39E | 29 | NWNESE | PUBLIC SERVICE CO OF OKLAHOMA | WELL | | STO | 35 | |
| W048619-00 | 1961 | 09S | 39E | 29 | SWNESE | PUBLIC SERVICE CO OF OKLAHOMA | WELL | | STO | 50 | |
| W048625-00 | 1961 | 09S | 39E | 29 | SWNESE | PUBLIC SERVICE CO OF OKLAHOMA | WELL | | DOM | 50 | |
| W048627-00 | 1953 | 09S | 39E | 29 | SWNESE | PUBLIC SERVICE CO OF OKLAHOMA | WELL | | DOM | 10 | |
| C052193-00 | 1983 | 09S | 39E | 29 | NWSE | VERNON J. STATES | WELL | | STO | 10 | 64 |
| W048624-00 | 1952 | 09S | 39E | 29 | SENWSE | PUBLIC SERVICE CO OF OKLAHOMA | WELL | | STO | 15 | |
| W183823-00 | 1930 | 09S | 39E | 32 | SWNE | SHELL MINING CO | WELL | | DOM | 15 | |
| W048621-00 | 1973 | 09S | 39E | 32 | NENENW | PUBLIC SERVICE CO OF OKLAHOMA | WELL | | STO | 10 | |
| W183826-00 | 1930 | 09S | 39E | 33 | NENWSE | SHELL MINING CO | WELL | | DOM | 20 | |
| W183658-00 | 1965 | 09S | 39E | 35 | SESENE | CONSOLIDATION COAL CO | WELL | | STO | 5 | |
| W111723 | | 10S | 38E | 5 | SWNESE | PADLOCK RANCH CO. INC. | WELL | | STO | 5 | |

**SURFACE WATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| P6388R | 12/10/1956 | 58 | 84 | 21 | SWSW | J. VERNON STATES | STATES SW #2 | UNA | STO | MIDDLE FORK YOUNGS CREEK |
| C29/301A | 03/14/1898 | 58 | 84 | 22 | NENE | A. H. ROUSCH | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C29/301A | 03/14/1898 | 58 | 84 | 22 | NWNE | A. H. ROUSCH | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C29/301A | 03/14/1898 | 58 | 84 | 22 | NWNE | A. H. ROUSCH | EISLE DITCH | PUD | IRR | LITTLE YOUNGS CREEK |
| C30/333A | 03/29/1898 | 58 | 84 | 22 | NENE | ARTHUR H. ROUSH | ROUSH DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C30/333A | 03/29/1898 | 58 | 84 | 22 | NWNE | ARTHUR H. ROUSH | ROUSH DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| P10585R | 09/19/1997 | 58 | 84 | 22 | NWNE | PITTSBURG & MIDWAY COAL MINING CO. | ROUSH | UNA | IND,STO, WIL,TEM | |
| P10585R | 09/19/1997 | 58 | 84 | 22 | SWNE | PITTSBURG & MIDWAY COAL MINING CO. | ROUSH | UNA | IND,STO, WIL,TEM | |
| P10585R | 09/19/1997 | 58 | 84 | 22 | NENW | PITTSBURG & MIDWAY COAL MINING CO. | ROUSH | UNA | IND,STO, WIL,TEM | |
| P10585R | 09/19/1997 | 58 | 84 | 22 | SENW | PITTSBURG & MIDWAY COAL MINING CO. | ROUSH | UNA | IND,STO, WIL,TEM | |
| P10585R | 09/19/1997 | 58 | 84 | 22 | NESW | PITTSBURG & MIDWAY COAL MINING CO. | ROUSH | UNA | IND,STO, WIL,TEM | |
| P362D | 11/12/1892 | 58 | 84 | 22 | NWNE | OSCAR OBERREICH | EISLE CREEK DITCH | PUD | IRR,DOM | EISELE CREEK |
| C27/265A | 03/14/1898 | 58 | 84 | 22 | NWNE | MARY SCULLENS | EISLE DITCH | PUD | IRR | LITTLE YOUNGS CREEK |
| C27/265A | 03/14/1898 | 58 | 84 | 23 | NWNE | MARY SCULLENS | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C27/265A | 03/14/1898 | 58 | 84 | 23 | SWNE | MARY SCULLENS | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C27/265A | 03/14/1898 | 58 | 84 | 23 | SWNW | MARY SCULLENS | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C27/265A | 03/14/1898 | 58 | 84 | 23 | SENW | MARY SCULLENS | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C27/266A | 12/11/1905 | 58 | 84 | 22 | NWNE | NICHOLAS SCULLENS | EISLE DITCH | PUD | IRR | LITTLE YOUNGS CREEK |
| C27/266A | 12/11/1905 | 58 | 84 | 23 | NENW | NICHOLAS SCULLENS | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C27/266A | 12/11/1905 | 58 | 84 | 23 | NWNW | NICHOLAS SCULLENS | EISLE DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| P12113S | 07/29/1994 | 58 | 84 | 22 | SENE | ASH CREEK MINING COMPANY | COUNTY ROAD | UNA | STO | LITTLE YOUNG'S CREEK |
| P1774D | 03/14/1898 | 58 | 84 | 22 | SENE | OSCAR OBERREICH**A.H. ROUSH | EISLE DITCH | UNA | IRR | LITTLE YOUNGS CREEK |
| P1774D | 03/14/1898 | 58 | 84 | 23 | NENW | OSCAR OBERREICH**A.H. ROUSH | EISLE DITCH | UNA | IRR | LITTLE YOUNGS CREEK |
| P1774D | 03/14/1898 | 58 | 84 | 23 | NWNW | OSCAR OBERREICH**A.H. ROUSH | EISLE DITCH | UNA | IRR | LITTLE YOUNGS CREEK |
| P8089R | 05/30/1979 | 58 | 84 | 22 | SENE | ASH CREEK MINING COMPANY | PSO #1 COUNTY ROAD | PUO | IND | LITTLE YOUNGS CREEK |
| P826R | 02/24/1906 | 58 | 84 | 22 | NENW | MARY SCULLEN | SCULLEN | PUO | STO,IRR | WEST BRANCH YOUNGS CREEK |
| P826R | 02/24/1906 | 58 | 84 | 22 | NWNW | MARY SCULLEN | SCULLEN | PU | STO,IRR | WEST BRANCH YOUNGS CREEK |
| P12112S | 07/29/1994 | 58 | 84 | 22 | NESW | ASH CREEK MINING COMPANY | SOUTHWEST | GST | STO | MIDDLE FORK YOUNG'S CREEK |
| P1620R | 07/27/1909 | 58 | 84 | 22 | SWSE | MARY WELCH | WELCH | PUO | IRR | NAMELESS CREEK |
| P1620R | 07/27/1909 | 58 | 84 | 22 | SESW | MARY WELCH | WELCH | PU | IRR | NAMELESS CREEK |
| P11893D | 10/03/1912 | 58 | 84 | 22 | NESE | MARY WELCH | WELCH DITCH #1 & LATERAL | UNA | IRR | OBERREICH DRAW |
| P11893D | 10/03/1912 | 58 | 84 | 23 | NESW | MARY WELCH | WELCH DITCH #1 & LATERAL | UNA | IRR | OBERREICH DRAW |
| P1790D | 03/29/1898 | 58 | 84 | 22 | NESE | ARTHUR H. ROUSH | ROUSH DITCH | EXP | IRR | LITTLE YOUNGS CREEK |
| P1790D | 03/29/1898 | 58 | 84 | 22 | NWSE | ARTHUR H. ROUSH | ROUSH DITCH | EXP | IRR | LITTLE YOUNGS CREEK |
| P1790D | 03/29/1898 | 58 | 84 | 23 | SWNW | ARTHUR H. ROUSH | ROUSH DITCH | EXP | IRR | LITTLE YOUNGS CREEK |
| P1790D | 03/29/1898 | 58 | 84 | 23 | SENW | ARTHUR H. ROUSH | ROUSH DITCH | EXP | IRR | LITTLE YOUNGS CREEK |
| P1790D | 03/29/1898 | 58 | 84 | 23 | NESW | ARTHUR H. ROUSH | ROUSH DITCH | EXP | IRR | LITTLE YOUNGS CREEK |
| P1790D | 03/29/1898 | 58 | 84 | 23 | NWSW | ARTHUR H. ROUSH | ROUSH DITCH | EXP | IRR | LITTLE YOUNGS CREEK |
| P11894D | 10/03/1912 | 58 | 84 | 22 | SESE | MARY WELCH | WELCH #2 DITCH | PUD | IRR | FLOOD WATER |
| P1722D | 01/24/1898 | 58 | 84 | 23 | NENE | DENIMON BROS. | DENIMON DITCH | UNA | STO,IRR | YOUNGS CREEK |

**SURFACE WATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| P1722D | 01/24/1898 | 58 | 84 | 23 | SENE | DENIMON BROS. | DENIMON DITCH | UNA | STO,IRR | YOUNGS CREEK |
| P1722D | 01/24/1898 | 58 | 84 | 24 | NWNW | DENIMON BROS. | DENIMON DITCH | ADJ | STO,IRR | YOUNGS CREEK |
| P1722D | 01/24/1898 | 58 | 84 | 24 | SENW | DENIMON BROS. | DENIMON DITCH | ADJ | STO,IRR | YOUNGS CREEK |
| P1722D | 01/24/1898 | 58 | 84 | 24 | NWSE | DENIMON BROS. | DENIMON DITCH | UNA | STO,IRR | YOUNGS CREEK |
| P1722D | 01/24/1898 | 58 | 84 | 24 | SWSE | DENIMON BROS. | DENIMON DITCH | UNA | STO,IRR | YOUNGS CREEK |
| P1722D | 01/24/1898 | 58 | 84 | 24 | SESE | DENIMON BROS. | DENIMON DITCH | UNA | STO,IRR | YOUNGS CREEK |
| P2898R | 06/24/1915 | 58 | 84 | 23 | SWNE | MARY N. SCULLEN | ENL OBERREICH | PUO | IRR | LITTLE YOUNGS CREEK |
| P2898R | 06/24/1915 | 58 | 84 | 23 | SENW | MARY N. SCULLEN | ENL OBERREICH | PU | IRR | LITTLE YOUNGS CREEK |
| C30/331A | 01/27/1909 | 58 | 84 | 23 | SWNE | NELLIE P. OBERREICH | OBERREICH RES | PUO | IRR | LITTLE YOUNGS CREEK |
| C30/331A | 01/27/1909 | 58 | 84 | 23 | SENW | NELLIE P. OBERREICH | OBERREICH RES | PU | IRR | LITTLE YOUNGS CREEK |
| C30/332A | 01/27/1909 | 58 | 84 | 23 | SWNE | NELLIE P. OBERREICH | OBERREICH DITCH | PUD | IRR | LITTLE YOUNGS CREEK |
| C30/332A | 01/27/1909 | 58 | 84 | 23 | NESE | NELLIE P. OBERREICH | OBERREICH DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C30/332A | 01/27/1909 | 58 | 84 | 24 | NWSW | NELLIE P. OBERREICH | OBERREICH DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C43/049A | 06/24/1915 | 58 | 84 | 23 | SWNE | MARY N. SCULLEN | ENL OBERREICH DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C43/049A | 06/24/1915 | 58 | 84 | 23 | SWNE | MARY N. SCULLEN | ENL OBERREICH DITCH | PUD | IRR | LITTLE YOUNGS CREEK |
| C43/049A | 06/24/1915 | 58 | 84 | 23 | SENE | MARY N. SCULLEN | ENL OBERREICH DITCH | ADJ | IRR | LITTLE YOUNGS CREEK |
| C37/284A | 10/03/1912 | 58 | 84 | 23 | NESW | MARY WELCH | WELCH #1 & LATERAL DITCH | ADJ | IRR | OBERREICH DRAW |
| C37/284A | 10/03/1912 | 58 | 84 | 23 | NWSW | MARY WELCH | WELCH #1 & LATERAL DITCH | ADJ | IRR | OBERREICH DRAW |
| C37/284A | 10/03/1912 | 58 | 84 | 23 | SESW | MARY WELCH | WELCH #1 & LATERAL DITCH | PUD | IRR | OBERREICH DRAW |
| C37/283A | 10/03/1912 | 58 | 84 | 23 | SWSW | MARY WELCH | WELCH RES | PU | IRR | OBERREICH DRAW |
| C37/283A | 10/03/1912 | 58 | 84 | 23 | SESW | MARY WELCH | WELCH RES | PUO | IRR | OBERREICH DRAW |
| C29/299A | 01/24/1898 | 58 | 84 | 24 | SWNW | OSCAR OBERREICH | DEMMON DITCH | ADJ | STO,IRR | YOUNGS CREEK |
| C29/299A | 01/24/1898 | 58 | 84 | 24 | NESW | OSCAR OBERREICH | DEMMON DITCH | ADJ | STO,IRR | YOUNGS CREEK |
| C29/299A | 01/24/1898 | 58 | 84 | 24 | NWSW | OSCAR OBERREICH | DEMMON DITCH | ADJ | STO,IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 84 | 24 | SESW | WESLEY R. PENNOYER | PEOPLES DITCH | PUD | IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 84 | 25 | | WESLEY R. PENNOYER | PEOPLES DITCH | ADJ | IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 84 | 25 | NWNE | WESLEY R. PENNOYER | PEOPLES DITCH | PU | IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 84 | 25 | SWNE | WESLEY R. PENNOYER | PEOPLES DITCH | PU | IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 83 | 30 | | WESLEY R. PENNOYER | PEOPLES DITCH | ADJ | IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 83 | 30 | SENW | WESLEY R. PENNOYER | PEOPLES DITCH | PU | IRR | YOUNGS CREEK |
| TD273A | 05/01/1887 | 58 | 83 | 30 | SESW | WESLEY R. PENNOYER | PEOPLES DITCH | PU | IRR | YOUNGS CREEK |
| C35/520A | 11/02/1910 | 58 | 84 | 24 | NESE | FRANK H. BAKER | BAKER #1 DITCH | ADJ | IRR | ASH CREEK |
| C43/048A | 03/05/1917 | 58 | 84 | 24 | SWSE | NETTIE A. VERLEY | ENL PEOPLES DITCH | PUD | IRR | YOUNGS CREEK |
| C43/048A | 03/05/1917 | 58 | 83 | 30 | NWSW | NETTIE A. VERLEY | ENL PEOPLES DITCH | ADJ | IRR | YOUNGS CREEK |
| C29/300A | 02/16/1909 | 58 | 84 | 24 | SESE | HENRY VERLEY | ENL GLADE WATER DITCH | PUD | IRR | YOUNGS CREEK |
| C29/300A | 02/16/1909 | 58 | 83 | 20 | NENW | HENRY VERLEY | ENL GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| C29/300A | 02/16/1909 | 58 | 83 | 20 | NWNW | HENRY VERLEY | ENL GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| C29/300A | 02/16/1909 | 58 | 83 | 20 | SWNW | HENRY VERLEY | ENL GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 84 | 25 | NENW | JOHN D. ADAMS | GLADE WATER DITCH | PUD | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 83 | 19 | | JOHN D. ADAMS | GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 83 | 19 | NESE | JOHN D. ADAMS | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 83 | 19 | SWSE | JOHN D. ADAMS | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 83 | 19 | SESE | JOHN D. ADAMS | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |

**SURFACE WATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| TD272AA | 04/15/1884 | 58 | 83 | 20 | | JOHN D. ADAMS | GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 83 | 20 | NWSW | JOHN D. ADAMS | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272AA | 04/15/1884 | 58 | 83 | 20 | SWSW | JOHN D. ADAMS | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| P3751E | 03/05/1917 | 58 | 84 | 25 | SWSE | Chevron USA, Inc. | VERLEY ENLG. OF PEOPLES DITCH | UNA | IRR | YOUNGS CREEK |
| P4098R | 09/17/1928 | 58 | 84 | 26 | SWSE | JOHN W. WHITE | WHITE | PU | STO,IRR | FLATBOTTOM DRAW |
| P4098R | 09/17/1928 | 58 | 84 | 35 | NENE | JOHN W. WHITE | WHITE | PUO | STO,IRR | FLATBOTTOM DRAW |
| P4098R | 09/17/1928 | 58 | 84 | 35 | NWNE | JOHN W. WHITE | WHITE | PU | STO,IRR | FLATBOTTOM DRAW |
| P11896D | 10/03/1912 | 58 | 84 | 27 | NENE | MARY WELCH | WELCH #4 DITCH | PUD | IRR | MOSQUITO DRAW |
| P11895D | 10/03/1912 | 58 | 84 | 27 | NWNE | MARY WELCH | WELCH #3 DITCH | PUD | IRR | FLOOD WATERS |
| P6387R | 12/10/1956 | 58 | 84 | 27 | NWNW | J. VERNON STATES | STATES SW #1 | UNA | STO | STATES DRAW |
| P1621R | 08/02/1909 | 58 | 84 | 27 | NESW | J. B. WULFF**C. C. REYNOLDS | WULFF - REYNOLDS | PU | IRR | DRY CREEK |
| P1621R | 08/02/1909 | 58 | 84 | 27 | SESW | J. B. WULFF**C. C. REYNOLDS | WULFF - REYNOLDS | PUO | IRR | DRY CREEK |
| C21/188A | 04/25/1904 | 58 | 84 | 28 | SWSW | JOSEPH J. RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/188A | 04/25/1904 | 58 | 84 | 28 | SESW | JOSEPH J. RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/188A | 04/25/1904 | 58 | 84 | 29 | SESE | JOSEPH J. RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/188A | 04/25/1904 | 58 | 84 | 33 | NENE | JOSEPH J. RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/188A | 04/25/1904 | 58 | 84 | 33 | NENW | JOSEPH J. RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/188A | 04/25/1904 | 58 | 84 | 33 | NWNE | JOSEPH J. RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C37/285A | 07/03/1915 | 58 | 84 | 29 | NESW | W. E. WAGNER | ASH CREEK CANYON DITCH | ADJ | IRR | ASH CREEK |
| C37/285A | 07/03/1915 | 58 | 84 | 29 | NWSW | W. E. WAGNER | ASH CREEK CANYON DITCH | ADJ | IRR | ASH CREEK |
| C37/285A | 07/03/1915 | 58 | 84 | 29 | SESW | W. E. WAGNER | ASH CREEK CANYON DITCH | ADJ | IRR | ASH CREEK |
| C37/286A | 07/03/1915 | 58 | 84 | 29 | SWSW | W. E. WAGNER | WAGNERS LITTLE ASH CREEK DITCH | ADJ | IRR | LITTLE ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 29 | SESE | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 33 | SENE | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 34 | SWNW | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 34 | SENW | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 34 | NESW | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 34 | NESE | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/189A | 04/25/1904 | 58 | 84 | 34 | NWSE | MARY RENIE | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C75/124A | 03/24/1983 | 58 | 84 | 33 | SWNE | GEORGE SCHREIBEIS | SCHREIBEIS SPRINKLER #3 | ADJ | IRR | ASH CREEK |
| C75/124A | 03/24/1983 | 58 | 84 | 33 | SENW | GEORGE SCHREIBEIS | SCHREIBEIS SPRINKLER #3 | ADJ | IRR | ASH CREEK |
| C75/124A | 03/24/1983 | 58 | 84 | 33 | NENW | GEORGE SCHREIBEIS | SCHREIBEIS SPRINKLER #3 | ADJ | IRR | ASH CREEK |
| C75/122A | 05/21/1982 | 58 | 84 | 33 | NWNW | GEORGE SCHREIBEIS | SCHREIBEIS SPRINKLER | ADJ | IRR | ASH CREEK |
| C75/123A | 03/24/1983 | 58 | 84 | 33 | NWNW | GEORGE SCHREIBEIS | SCHREIBEIS SPRINKLER #2 | ADJ | IRR | ASH CREEK |
| P5985D | 04/25/1904 | 58 | 84 | 34 | NENW | RENIE**MINNIE AMELIA PRESTON WAGNER | ASH CREEK DITCH #4 | UNA | IRR | ASH CREEK |
| C21/190A | 04/25/1904 | 58 | 84 | 35 | NESW | M. A. P. WAGNER | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/190A | 04/25/1904 | 58 | 84 | 35 | NWSW | M. A. P. WAGNER | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/190A | 04/25/1904 | 58 | 84 | 35 | SWSW | M. A. P. WAGNER | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/190A | 04/25/1904 | 58 | 84 | 35 | SESW | M. A. P. WAGNER | ASH CREEK #4 DITCH | ADJ | IRR | ASH CREEK |
| C21/187A | 04/25/1904 | 58 | 84 | 35 | SWSE | M. A. P. WAGNER | ASH CREEK #3 DITCH | ADJ | IRR | ASH CREEK |
| C21/187A | 04/25/1904 | 58 | 84 | 35 | SESE | M. A. P. WAGNER | ASH CREEK #3 DITCH | ADJ | IRR | ASH CREEK |
| C71/084A | 03/05/1963 | 58 | 84 | 36 | SWNE | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |

**SURFACE WATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| C71/084A | 03/05/1963 | 58 | 84 | 36 | SENE | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/084A | 03/05/1963 | 58 | 84 | 36 | SESW | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/084A | 03/05/1963 | 58 | 84 | 36 | NESE | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/084A | 03/05/1963 | 58 | 84 | 36 | NWSE | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/084A | 03/05/1963 | 58 | 84 | 36 | NWSE | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/084A | 03/05/1963 | 58 | 84 | 36 | SWSE | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/084A | 03/05/1963 | 57 | 84 | 2 | SESW | RALPH DELAPP | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C29/296A | 04/25/1907 | 58 | 84 | 36 | SENE | W. E. WAGONER | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C29/296A | 04/25/1907 | 58 | 84 | 36 | NESE | W. E. WAGONER | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C29/296A | 04/25/1907 | 57 | 84 | 2 | SESW | W. E. WAGONER | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C29/296A | 04/25/1907 | 58 | 83 | 31 | SWNW | W. E. WAGONER | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| P5012R | 01/23/1939 | 58 | 84 | 36 | NENW | E. S. TOWNSEND | TOWNSEND #1 | PU | STO,IRR | DRY DRAW |
| P5012R | 01/23/1939 | 58 | 84 | 36 | NWNW | E. S. TOWNSEND | TOWNSEND #1 | PU | STO,IRR | DRY DRAW |
| P5012R | 01/23/1939 | 58 | 84 | 36 | SWNW | E. S. TOWNSEND | TOWNSEND #1 | PU | STO,IRR | DRY DRAW |
| P5012R | 01/23/1939 | 58 | 84 | 36 | SENW | E. S. TOWNSEND | TOWNSEND #1 | PUO | STO,IRR | DRY DRAW |
| TD319A | 04/12/1887 | 58 | 84 | 36 | NWNW | W.E. WAGNER | ASH CREEK DITCH | AME | | ASH CREEK |
| C57/462A | 04/12/1887 | 58 | 84 | 36 | NESE | E. S. TOWNSEND | ASH CREEK DITCH | ADJ | IRR | ASH CREEK |
| C57/462A | 04/12/1887 | 58 | 84 | 36 | NWSE | E. S. TOWNSEND | ASH CREEK DITCH | ADJ | IRR | ASH CREEK |
| C57/462A | 04/12/1887 | 58 | 84 | 36 | SWSE | E. S. TOWNSEND | ASH CREEK DITCH | ADJ | IRR | ASH CREEK |
| C57/462A | 04/12/1887 | 57 | 84 | 1 | NWNW | E. S. TOWNSEND | ASH CREEK DITCH | ADJ | IRR | ASH CREEK |
| C21/179A | 06/21/1902 | 58 | 84 | 36 | NESE | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 58 | 84 | 36 | SWSE | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 58 | 84 | 36 | SESE | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 57 | 84 | 1 | NENE | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 57 | 84 | 1 | SENE | WM. E. WAGNER | PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 58 | 83 | 31 | SWNW | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 58 | 83 | 31 | NWSW | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/179A | 06/21/1902 | 58 | 83 | 31 | SWSW | WM. E. WAGNER | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| P2016E | 04/25/1907 | 58 | 84 | 36 | NWSE | W. E. WAGNER | INTERSTATE DITCH (PENNOYER, WAGNER LAT.) | UNA | IRR | TONGUE RIVER |
| P2016E | 04/25/1907 | 58 | 84 | 36 | SESE | W. E. WAGNER | INTERSTATE DITCH (PENNOYER, WAGNER LAT.) | UNA | IRR | TONGUE RIVER |
| P2016E | 04/25/1907 | 58 | 83 | 31 | SWSW | W. E. WAGNER | INTERSTATE DITCH (PENNOYER, WAGNER LAT.) | UNA | IRR | TONGUE RIVER |

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| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| C37/255A | 06/21/1902 | 57 | 84 | 1 | NWNE | ROBERT H. HERLAND | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C71/085A | 05/20/1963 | 57 | 84 | 1 | NWNE | MARY C. JOHNSON | OCONNOR SPRINKLER SYSTEM | ADJ | IRR | TONGUE RIVER |
| C71/085A | 05/20/1963 | 57 | 84 | 1 | NENW | MARY C. JOHNSON | OCONNOR SPRINKLER SYSTEM | ADJ | IRR | TONGUE RIVER |
| C71/085A | 05/20/1963 | 57 | 84 | 2 | SESW | MARY C. JOHNSON | OCONNOR SPRINKLER SYSTEM | PUD | IRR | TONGUE RIVER |
| P3998D | 06/21/1902 | 57 | 84 | 1 | SWNE | Chevron USA, Inc. | PENNOYER | UNA | IRR,DOM | TONGUE RIVER |
| P3998D | 06/21/1902 | 57 | 84 | 1 | SENE | Chevron USA, Inc. | PENNOYER | UNA | IRR,DOM | TONGUE RIVER |
| P3998D | 06/21/1902 | 57 | 84 | 1 | SENW | Chevron USA, Inc. | PENNOYER | UNA | IRR,DOM | TONGUE RIVER |
| C21/183A | 12/11/1905 | 57 | 84 | 1 | SENE | DORA BROWN | ENL EVANS DITCH | PUD | IRR | TONGUE RIVER |
| C72/364A | 03/26/1975 | 57 | 84 | 1 | NENW | DONALD BERT & LUELLA M. STROUP | ENL O'CONNER #2 SPRINKLER SYSTEM | ADJ | IRR | ASH SPRINGS |
| C72/364A | 03/26/1975 | 57 | 84 | 1 | NWNW | DONALD BERT & LUELLA M. STROUP | ENL O'CONNER #2 SPRINKLER SYSTEM | ADJ | IRR | ASH SPRINGS |
| C72/023A | 05/20/1963 | 57 | 84 | 1 | NWNW | DONALD BERT & LUELLA M. STROUP | OCONNOR #2 SPRINKLER SYSTEM | ADJ | IRR | ASH SPRINGS |
| P5061S | 07/01/1963 | 57 | 84 | 1 | SWNW | ALVIN T. O'CONNOR | O'CONNOR | PUO | STO | OCONNER DR |
| OD1/084A | 09/20/1893 | 57 | 84 | 1 | NWSW | | W W SPRINKLERS #1 #2 #3 #4 | PUD | IRR | TONGUE RIVER |
| OD1/084A | 09/20/1893 | 57 | 84 | 2 | SESW | | W W SPRINKLERS #1 #2 #3 #4 | PUD | IRR | TONGUE RIVER |
| OD1/084A | 09/20/1893 | 57 | 84 | 2 | NESE | | W W SPRINKLERS #1 #2 #3 #4 | PUD | IRR | TONGUE RIVER |
| P7899D | 04/25/1907 | 57 | 84 | 1 | SWSW | W.E. WAGNER | WAGNER DITCH #2 | UNA | IRR,DOM | TONGUE RIVER |
| P7899D | 04/25/1907 | 57 | 84 | 1 | SESW | W.E. WAGNER | WAGNER DITCH #2 | UNA | IRR,DOM | TONGUE RIVER |
| P2015E | 04/25/1907 | 57 | 84 | 1 | NESE | W. E. WAGNER | EVANS DITCH (ENL. OF) | PUH | IRR | TONGUE RIVER |
| P2775E | 02/24/1913 | 57 | 84 | 1 | NESE | W. E. WAGNER | EVANS DITCH (ENL. OF) | PUH | IRR | TONGUE RIVER |
| P2410R | 06/26/1912 | 57 | 84 | 1 | SWSE | LENA B. DRISCOLL**MAUD G. FOSTER**ELERY D. FOSTER | SUPPLY | PUO | IRR | TONGUE RIVER |
| P8102R | 02/05/1979 | 57 | 84 | 2 | SENE | SHERIDAN ENTERPRISES, INC. | POND-C1 | PUO | IND | DRAINAGE OF TONGUE RIVER |
| P8100R | 02/05/1979 | 57 | 84 | 2 | NESW | SHERIDAN ENTERPRISES, INC. | POND-A | PUO | IND | SMOKEY DRAW |
| P8101R | 02/05/1979 | 57 | 84 | 2 | NESW | SHERIDAN ENTERPRISES, INC. | POND-A TEMPORARY | PUO | IND,MIS | DRAINAGE OF TONGUE RIVER |
| C21/178A | 06/21/1902 | 57 | 84 | 2 | SESW | E. A. WHITNEY | PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 30 | NWNE | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 30 | SWNE | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 30 | NESW | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 30 | SESW | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 30 | NWSE | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 30 | SWSE | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 31 | NWNE | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C21/178A | 06/21/1902 | 58 | 83 | 31 | NENW | E. A. WHITNEY | PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/313A | 06/03/1907 | 57 | 84 | 2 | SESW | E. G. FOSS | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/313A | 06/03/1907 | 58 | 83 | 20 | SWNE | E. G. FOSS | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/313A | 06/03/1907 | 58 | 83 | 20 | NWSE | E. G. FOSS | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C62/409A | 04/23/1951 | 57 | 84 | 2 | SESW | HENRY C. VERLEY | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C62/409A | 04/23/1951 | 58 | 83 | 20 | NENW | HENRY C. VERLEY | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C62/409A | 04/23/1951 | 58 | 83 | 20 | SWNW | HENRY C. VERLEY | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |

**SURFACE WATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| C62/409A | 04/23/1951 | 58 | 83 | 20 | SENW | HENRY C. VERLEY | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 57 | 84 | 2 | SESW | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 19 | NESE | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 19 | SWSE | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 19 | SESE | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 20 | NWSW | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 20 | SWSW | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 30 | NWNE | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 30 | SWNE | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 30 | NENW | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 30 | SENW | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/115A | 04/27/1955 | 58 | 83 | 30 | NESW | WILLIAM F. BARBULA | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C64/280A | 10/20/1954 | 57 | 84 | 2 | SESW | HENRY C. VERLEY | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | PUD | IRR | TONGUE RIVER |
| C64/280A | 10/20/1954 | 58 | 83 | 30 | NWSW | HENRY C. VERLEY | ENL INTERSTATE DITCH, ENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| CR7/345A | 03/23/1973 | 58 | 83 | 19 | SENE | INC. BARBULA-TURLEY RANCH | BARBULA TURLEY #1 STOCK RES | PUO | STO | FOSS DRAW |
| C31/314A | 06/03/1907 | 58 | 83 | 19 | SWSE | CHENVRON USA, INC. | PENNOYER DITCH, INTERSTATE DITCH (ENL. OF) | ADJ | IRR | TONGUE RIVER |
| C31/314A | 06/03/1907 | 58 | 83 | 19 | SESE | W. S. METZ | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/314A | 06/03/1907 | 58 | 83 | 20 | NESW | W. S. METZ | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/314A | 06/03/1907 | 58 | 83 | 20 | NWSW | W. S. METZ | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/314A | 06/03/1907 | 58 | 83 | 20 | SWSW | W. S. METZ | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/314A | 06/03/1907 | 58 | 83 | 20 | SESW | W. S. METZ | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/314A | 06/03/1907 | 58 | 83 | 20 | SWSE | W. S. METZ | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| TD272BA | 04/15/1884 | 58 | 83 | 20 | | HENRY VERLEY | GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| TD272BA | 04/15/1884 | 58 | 83 | 20 | SWNE | HENRY VERLEY | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272BA | 04/15/1884 | 58 | 83 | 20 | SENW | HENRY VERLEY | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272BA | 04/15/1884 | 58 | 83 | 20 | NESE | HENRY VERLEY | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272BA | 04/15/1884 | 58 | 83 | 20 | NWSE | HENRY VERLEY | GLADE WATER DITCH | PU | IRR | YOUNGS CREEK |
| TD272CA | 04/15/1884 | 58 | 83 | 20 | | JOHN W. BOYLE | GLADE WATER DITCH | ADJ | IRR | YOUNGS CREEK |
| P1724E | 06/03/1907 | 58 | 83 | 20 | NENE | CHENVRON USA, INC. | PENNOYER DITCH, INTERSTATE DITCH (ENL. OF) | UNA | IRR | TONGUE RIVER |
| P1724E | 06/03/1907 | 58 | 83 | 20 | NWNE | CHENVRON USA, INC. | PENNOYER DITCH, INTERSTATE DITCH (ENL. OF) | UNA | IRR | TONGUE RIVER |

**SURFACE WATER RIGHTS - WYOMING**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| P1724E | 06/03/1907 | 58 | 83 | 20 | SENE | CHENVRON USA, INC. | PENNOYER DITCH, INTERSTATE DITCH (ENL. OF) | UNA | IRR | TONGUE RIVER |
| C37/256A | 06/03/1907 | 58 | 83 | 20 | NENE | MABEL M. BOYLE | ENL PENNOYER DITCHINTERSTATE DITCH | ADJ | IRR | TONGUE RIVER |
| C37/256A | 06/03/1907 | 58 | 83 | 20 | NWNE | MABEL M. BOYLE | ENL PENNOYER DITCHINTERSTATE DITCH | ADJ | IRR | TONGUE RIVER |
| C31/315A | 06/03/1907 | 58 | 83 | 20 | SWNE | H. C. VERLEY | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| C31/315A | 06/03/1907 | 58 | 83 | 20 | SENW | H. C. VERLEY | INTERSTATE DITCHENL PENNOYER DITCH | ADJ | IRR | TONGUE RIVER |
| CR7/344A | 03/23/1973 | 58 | 83 | 20 | NWNW | INC. BARBULA-TURLEY RANCH | BARBULA TURLEY #2 STOCK RES | PUO | STO | VERLEY DRAW |
| P5848E | 10/16/1953 | 58 | 83 | 20 | NESE | W. A. SEELY | WALKER-BOYER DITCH, SEELY ENL. OF | UNA | IRR | TONGUE RIVER |
| P5848E | 10/16/1953 | 58 | 83 | 20 | NWSE | W. A. SEELY | WALKER-BOYER DITCH, SEELY ENL. OF | UNA | IRR | TONGUE RIVER |
| P5848E | 10/16/1953 | 58 | 83 | 20 | SWSE | W. A. SEELY | WALKER-BOYER DITCH, SEELY ENL. OF | PUD | IRR | TONGUE RIVER |
| P5848E | 10/16/1953 | 58 | 83 | 20 | SWSE | W. A. SEELY | WALKER-BOYER DITCH, SEELY ENL. OF | PUH | IRR | TONGUE RIVER |
| TD323A | 06/04/1890 | 58 | 83 | 29 | | T. L. ROWLAND | ROWLAND DITCH CO DITCH | ADJ | IRR | TONGUE RIVER |
| TD323A | 06/04/1890 | 58 | 83 | 29 | SWSW | T. L. ROWLAND | ROWLAND DITCH CO DITCH | PU | IRR | TONGUE RIVER |
| TD323A | 06/04/1890 | 58 | 83 | 30 | SESE | T. L. ROWLAND | ROWLAND DITCH CO DITCH | PU | IRR | TONGUE RIVER |
| P32248D | 11/03/1999 | 58 | 83 | 29 | NWNW | LEROY TAYLOR | TAYLOR INVESTMENTS, LLC, NO. 1 PUMP | UNA | IRR | TONGUE RIVER |
| P32248D | 11/03/1999 | 58 | 83 | 30 | NENE | LEROY TAYLOR | TAYLOR INVESTMENTS, LLC, NO. 1 PUMP | UNA | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 29 | NWNW | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 29 | SWNW | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 29 | SENW | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 29 | NESW | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 29 | NWSW | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 30 | NENE | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 30 | SENE | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 30 | NESE | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| CA1/266A | 04/20/1897 | 58 | 83 | 30 | NWSE | A. R. FRISBIE | ENL ROWLAND DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | NENE | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | NWNE | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | SWNE | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | SENE | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | SENW | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | NESW | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | NWSW | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | SWSW | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | SESW | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | NWSE | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |
| C62/004A | 03/15/1945 | 58 | 83 | 31 | SWSE | INC. WHITNEY BENEFITS | WHITNEY DITCH | ADJ | IRR | TONGUE RIVER |

**SURFACE WATER RIGHTS - MONTANA**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| W048615-00 | 02/26/1898 | 09S | 39E | 32 | Lot 4 | PSO | | | IRR | LITTLE YOUNGS CREEK |
| W048618-00 | 12/19/11 | 09S | 39E | 32 | Lot 4 | PSO | | | IRR | LITTLE YOUNGS CREEK |
| W183838-00 | 11/26/08 | 09S | 39E | 32 | Lot 6 | SHELL MINING CO | | | STO | LITTLE YOUNGS CREEK |
| W183885-00 | 02/26/1898 | 09S | 39E | 32 | Lot 4 | SHELL MINING CO | | | IRR | LITTLE YOUNGS CREEK |
| W183888-00 | 12/19/11 | 09S | 39E | 32 | Lot 4 | SHELL MINING CO | | | IRR | LITTLE YOUNGS CREEK |
| W183874-00 | 05/01/11 | 09S | 39E | 33 | NESW NE | SHELL MINING CO | | | IRR | YOUNGS CREEK |

**SURFACE WATER RIGHTS - MONTANA**

| Permit No. | Priority | Tns | Rng | Sec | qq | Applicant | Facility Name | Status | Uses | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| W183862-00 | | 09S | 39E | 34 | SW | SHELL MINING CO | | | STO | YOUNGS CREEK |
| W183893-00 | 05/01/10 | 10S | 38E | 1 | Lot 3 | SHELL MINING CO | | | IRR | LITTLE YOUNGS CREEK |
| W183844-00 | | 10S | 38E | 1 | SWSW NE | SHELL MINING CO | | | STO | LITTLE YOUNGS CREEK |

**Abbreviations for status: A&C=Abandoned and Cancelled; E&C=Eliminated and Cancelled; ABA=Abandoned; ADJ=Adjudicated; AME=Amended (Lands moved to new location no longer under this permit); CAN=Cancelled;** DSC=Description; ELI=Eliminated; EXP=Expired; GST=Good standing pending receipt of legally required notices; OTH=Other; PU or PUW=Point of use for a well (does not mean the right is valid - a further check should be made of the actural record); REJ=Rejected by the State Engineer; REC=Lands received from another permit; REM=Remaining; TEM=Temporary; TRA=Transferred to another permit; UNA=Unadjudicated; ?=No entry in the data base for this appropriation.

**Abbreviations for uses: DEW=Dewatering; DOM=Domestic; DSP=Domestic supply; FIS=Fish propagation; FLO=Flood control; HEX=Heat extraction; IND=Industrial; IRR=Irrigation; MAN=Manufacturing; MED=Medicinal;** MIN=Mining; MIS=Miscellaneous; MON=Monitoring; MUN=Municipal; POW=Power development; REC=Recreation; RES=Reservoir supply; STO=Stock; TEM=Temporary use (normally construction of roads or oil well drilling); TST=Test Well; UTI=Public utility; WET=Wetlands; WIL=Wildlife.

**Abbreviations for supply types (SupTy): ORI=Original supply; SUP=Supplemental supply from another surface water source; SEC=Supply from a reservoir; ADD=Additional supply from a well.**

**Record suffixes are denoted as follows: "A" indicates adjudicated or finalized water rights and unless the right is a territorial appropriation, there will be a match in the reference column from one of the following permit types for the** unadjudicated portion of the water right. "C" permits are well statements of claim, filed from 1947 to 1957 for wells completed prior to April 1, 1947. "G" permits are well registrations, filed for wells completed after April 1, 1947. "P" permits are for stock and domestic use wells completed prior to May 24, 1969 and registered with the SEO prior to December 31, 1972. "W" permits are for wells with a priority date for the date of filing with the State Engineer. "D" signifies a ditch or pipeline permit. "E" signifies an enlargement ditch or pipeline permit. "S" signifies a stock reservoir permit. "R" signifies a reservoir permit.

# APPENDIX F

POTENTIAL HEALTH EFFECTS FROM
RELEASE OF NITROGEN DIOXIDE ($NO_2$)

## General Chemistry of Nitrogen Dioxide

$NO_2$ is a gas above about 70 degrees F. It is reddish-brown. It is heavier than air, with a vapor density of 1.58 (air = 1.0). It has a pungent odor. The odor threshold, or concentration at which most people can identify it, is roughly 1-6 ppm. One part per million (ppm) in air = 1.88 $mg/m^3$, equal to 1,880 $\mu g/m^3$.

Nitrogen dioxide is highly reactive. It is a strong oxidizing agent and is corrosive to metals. It combines with water to form nitric acid ($HNO_3$) and nitric oxide (NO).

Nitrogen dioxide is significantly different from nitrous oxide or dinitrogen monoxide, designated by the molecular formula $N_2O$ and usually referred to as laughing gas. In contrast to nitrogen dioxide, nitrous oxide is rather stable, and although it is a central nervous system depressant and an asphyxiant, is not irritating to the respiratory tract. It is used as an anesthetic, especially in dentistry, at concentrations of up to 70% (700,000 ppm) with no respiratory toxicity.

## Sources of $NO_2$ and NO

Nitrogen dioxide and nitrous oxides are formed from the incomplete combustion (burning) of nitrogen-containing chemicals. Incomplete combustion means that the combusted materials are not broken down completely. The concentrations of NO and $NO_2$ are expected to be about the same, or predominately $NO_2$, because NO reacts with atmospheric oxygen and chemically converts to $NO_2$ after both are formed. Sources of $NO_2$ include automobiles, welding, natural gas appliances, cigarette smoke, and explosives.

## Toxicity

Nitrogen dioxide gas may cause significant toxicity because of its ability to form nitric acid with water in the eye, lung, mucous membranes and skin.

Nitrogen dioxide is considered to have poor "warning properties" because it is not immediately sensed at concentrations which can cause significant lung damage or even death.

The exact concentrations at which $NO_2$ will cause various health effects cannot be predicted with complete accuracy, because the effects are a function of air concentration and time of exposure, and precise measurements have not been made in association with human toxicity. The information that is available from human exposures also suggests that there is some variation in individual response. The concentrations in the following discussion are therefore approximate.

**Acute Exposure**

When inhaled $NO_2$ may cause death by acute broncho-spasm (airway closing), pulmonary edema (damage to fine tissues of the lung), or bronchiolitis obliterans (obstruction of the fine lung passages, secondary to tissue damage). Potentially fatal pulmonary edema can occur following minimal early symptoms. Symptoms usually occur within 1-2 hours of exposure, but may be delayed up to 72 hours.

The IDLH ("immediately dangerous to life and health") concentration is 20 ppm. Depending on the length of exposure, high concentrations of $NO_2$ may also cause pneumonia (generalized lung inflammation), and bronchiolitis (inflammation of the bronchioles). Recovery may be either complete or may involve some degree of impairment of pulmonary function. Acute exposure to high concentrations of $NO_2$ may cause serious eye irritation and damage.

**Chronic Exposure**

Chronic or repeated exposure to lower concentrations of $NO_2$ may exacerbate pre-existing respiratory conditions, or increase the incidence of respiratory infections. For example, in one study of workers in a diesel bus garage, respiratory symptoms were elevated when concentrations of $NO_2$ were above 0.3 ppm.

Persons considered sensitive to $NO_2$ toxicity include children, persons with decreased ventilatory reserves (the elderly and persons with COPD - chronic obstructive pulmonary diseases, including asthma, bronchitis and emphysema), and persons who are at risk for developing infections, such as persons undergoing chemotherapy for malignancies, persons with acute leukemia and patients who have had bone marrow transplantations.

Numerous indoor air studies on the effects of nitrogen oxides on respiratory infections indicates that $NO_2$ exposure increases the risk of respiratory symptoms in children aged 5 to 12 years. Although it may not be possible to estimate a relationship between concentration and effects, one analysis of these studies suggested that for every increase of 0.015 ppm in 2-week average exposures to $NO_2$ there is an increased risk of 20% of respiratory symptoms and disease.

Asthmatics may be the group most susceptible to $NO_2$ because their airways are hyper-responsive to irritants. In controlled studies, asthmatics have experienced symptoms, but not changes in lung function at concentrations as low as 0.5 ppm for 2 hours. Their responsiveness to exercise or other irritants, however, has been shown to be enhanced by $NO_2$ exposures as low as 0.1 ppm.

$NO_2$ Levels of Interest
(1 ppm = 1.88 mg/m$^3$ = 1,880 µg/m$^3$)

| | ppm | mg/m$^3$ |
|---|---|---|
| EPA National Ambient Air Quality Standard (yearly average) | 0.05 | 0.09 |
| EPA Significant Harm Level (1-hour average) | 2 | 3.76 |
| Odor threshold | 1-6 | 1.90-11.20 |
| OSHA Permissible Exposure Level (PEL)[1] | 3 | 5.64 |
| OSHA Short-Term (15 min) Exposure Limit (STEL)[2] | 5 | 9.40 |
| NIOSH recommended Short-Term Exposure Limit (15 min) | 1 | 1.88 |
| NIOSH Immediately Dangerous to Life & Health (IDLH)[3] | 20 | 37.60 |

$NO_2$ is a SARA TITLE III Extremely Hazardous Substance (40 CFR Table 302.4)
Reportable Quantity: 10 pounds
Threshold Planning Quantity: 100 pounds

[1] PEL (Permissible Exposure Levels) are enforceable workplace standards which may not be exceeded during any 8-hour work shift of a 40-hour work week. In July 1992 the 11th Circuit Court of Appeals vacated more protective PELS set by OSHA in 1989, moving them back as standards set in 1971. $NO_2$ was changed back to 3 ppm from 1 ppm. In 1989 OSHA had adopted a ceiling (a value which should not be exceeded at any time) of 5 ppm. There is no current ceiling level for $NO_2$.

[2] A STEL is a 15-minute time-weighted average exposure that should not be exceeded at any time during a workday.

[3] The IDLH is "a condition that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such environment." (NIOSH, 1994).