



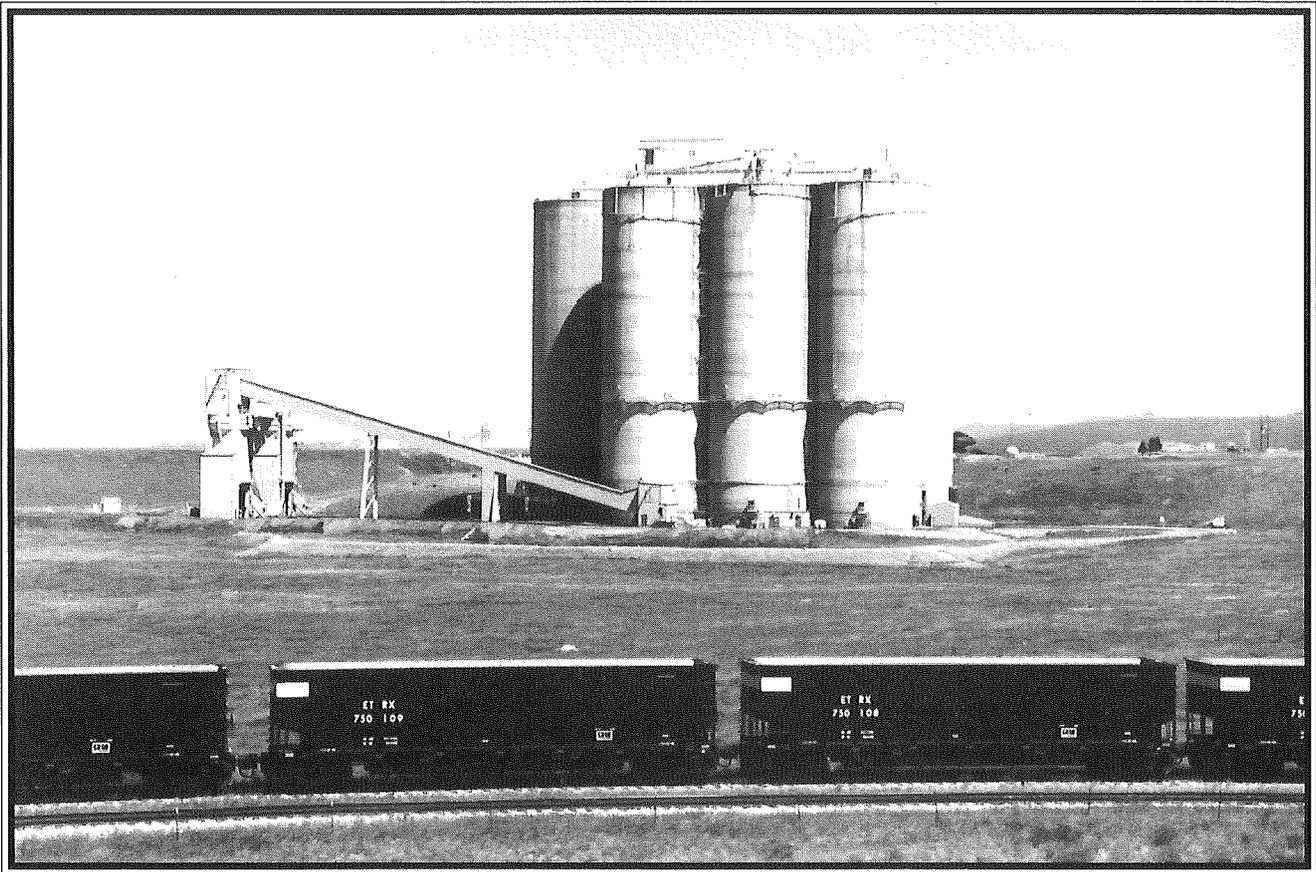
U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office

Casper District Office

February 1998



FINAL
Environmental Impact Statement
for the Powder River Coal Lease
Application (WYW136142) and
Thundercloud Coal Lease
Application (WYW136458)



The Bureau of Land Management is responsible for the balanced management of the public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield; a combination of uses that take into account the long term needs of future generations for renewable and nonrenewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific and cultural values.

BLM/WY/PL-98/004+1320

FEIS #98-1



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:

3420(LBA)(930)
WYW136142
Powder River
WYW136458
Thundercloud

23 JAN 1998

Dear Reader:

This Final Environmental Impact Statement (EIS) has been prepared pursuant to 40 CFR 1500-1508 for the Powder River (WYW136142) and Thundercloud (WYW136458) coal lease applications, located in southeastern Campbell County, Wyoming. This copy of the final EIS is provided for your review. It is not a decision document, its purpose is to inform you of the impacts of leasing and mining the Federal coal proposed for lease in two maintenance coal lease applications, and to evaluate alternatives to the proposals.

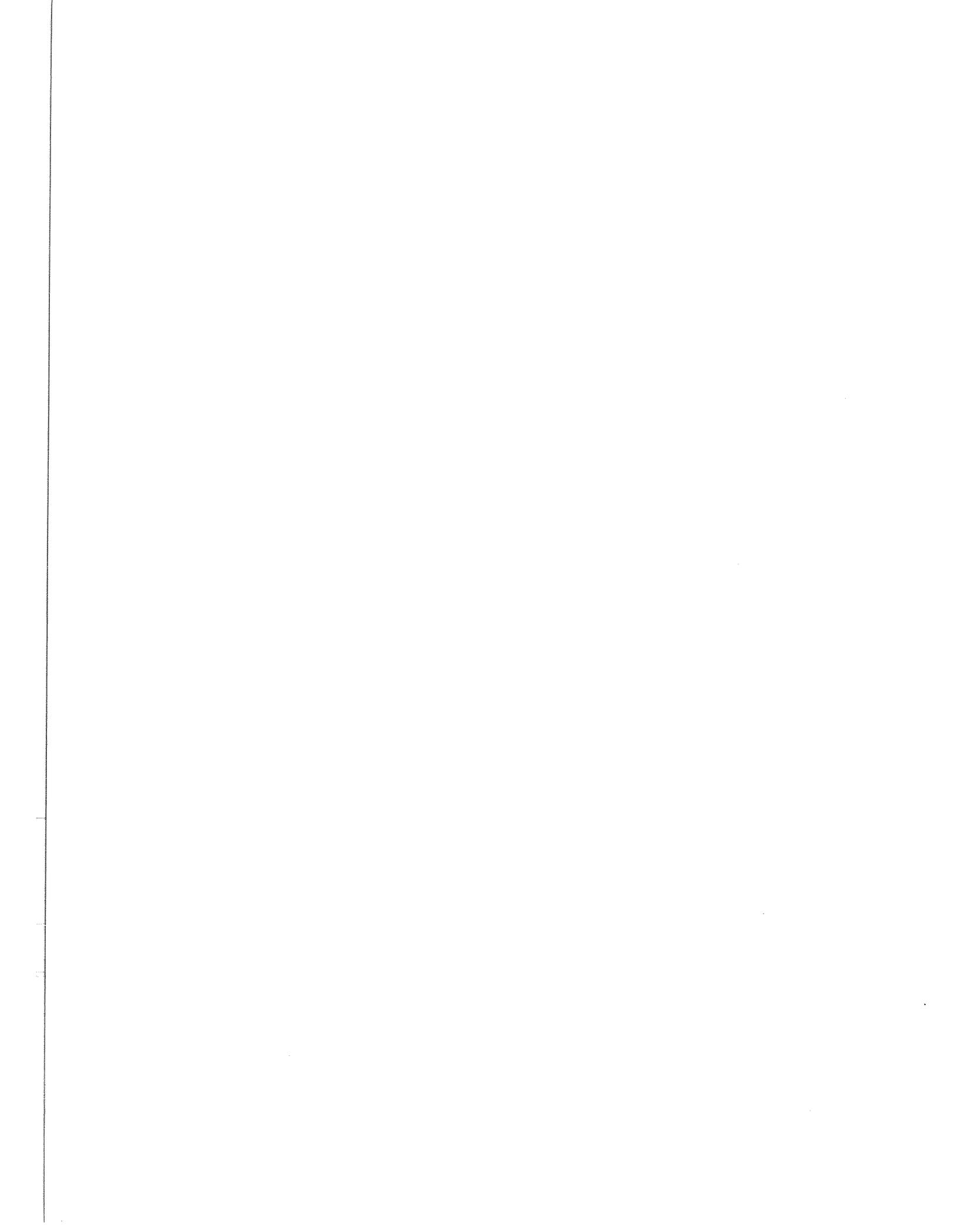
The draft EIS was mailed to the public in August of 1997, and the comment period extended through October 28, 1997. A formal public hearing on the proposed Powder River and Thundercloud coal lease applications was held at 7:00 PM on Wednesday, October 8, 1997, at the Holiday Inn, 2009 S. Douglas Highway, Gillette, Wyoming. The purpose of the hearing was to receive comments on the proposed coal lease sale, on the fair market value, and maximum economic recovery of the Federal coal resources in the proposed Powder River and Thundercloud tracts, and on the draft EIS.

Ten comment letters were received on the draft EIS. The final EIS considers these comments, which are included along with BLM's responses, as Appendix H of the final EIS.

BLM will make a separate decision for each of the two tracts evaluated in this Final EIS. A separate Record of Decision detailing the BLM decision to lease or not to lease the Federal coal included in each tract will be prepared and distributed following a 30 day Final EIS review period. If you have any questions or comments related to the decision to lease the Federal coal in the Powder River and Thundercloud LBA Tracts, please address them to Bureau of Land Management, Casper District Office, Attn: Nancy Doelger, 1701 East "E" Street, Casper, WY 82601, fax: 307-234-1525, phone: 307-261-7627.

Sincerely,


Alan R. Pierson
State Director



FINAL

**ENVIRONMENTAL IMPACT STATEMENT FOR THE
POWDER RIVER COAL LEASE APPLICATION
(FEDERAL COAL LEASE APPLICATION WYW136142)
AND THE
THUNDERCLOUD COAL LEASE APPLICATION
(FEDERAL COAL LEASE APPLICATION 136458)**

Prepared by

**Western Water Consultants
Sheridan, Wyoming**

and

**U.S. Department of the Interior
Bureau of Land Management
Casper District Office**

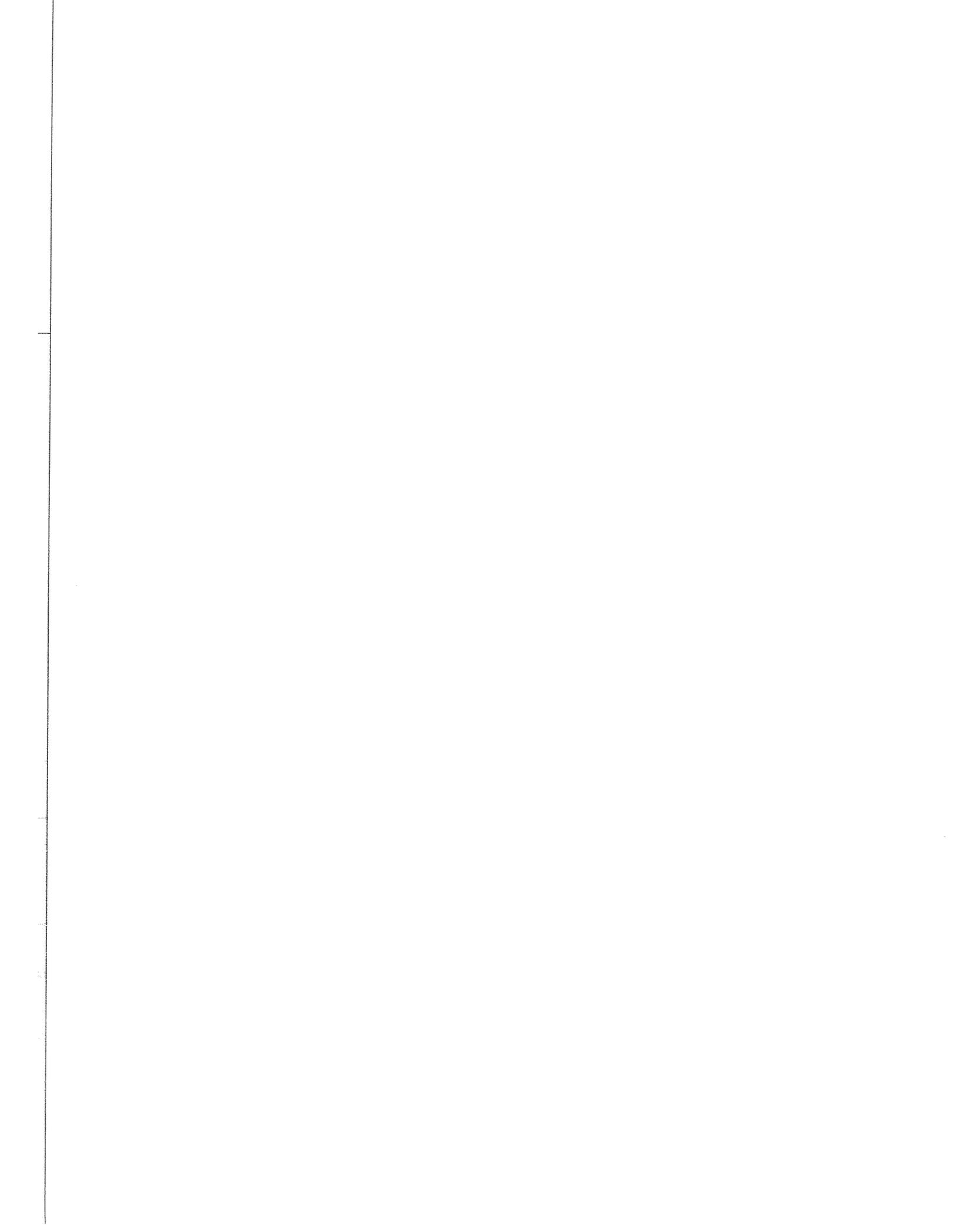
Cooperating Agencies

U.S. Office of Surface Mining Reclamation and Enforcement

and

U.S. Forest Service

JANUARY 1998



**POWDER RIVER COAL LEASE APPLICATION (WYW136142) AND
THUNDERCLOUD COAL LEASE APPLICATION (WYW136458)
ENVIRONMENTAL IMPACT STATEMENT
ABSTRACT**

[] Draft [X] Final

Lead Agency:

U.S. Department of the Interior, Bureau of Land Management

Cooperating Agencies:

U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement

U.S. Department of Agriculture, Forest Service

Counties That Could Be Directly Affected:

Campbell County, Wyoming

Converse County, Wyoming

Abstract:

This Final Environment Impact Statement (FEIS) assesses the environmental consequences of a federal decision to offer two federal coal tracts in southeastern Campbell County, Wyoming for lease at separate, competitive, sealed bid sales, subject to standard and special lease stipulations. The Powder River Lease By Application (LBA) Tract as applied for by Powder River Coal Company includes approximately 4,020 acres containing approximately 515 million tons of federal coal. Powder River Coal Company operates the adjacent North Antelope and Rochelle Mines. The Thundercloud LBA Tract, which is located approximately 9 miles north of the Powder River LBA Tract, was applied for by Kerr-McGee Coal Company, the operator of the adjacent Jacobs Ranch Mine. It includes approximately 3,400 acres containing about 427 million tons of federal coal as applied for. This FEIS describes the physical, biological, cultural, historic, and socioeconomic resources in and surrounding the project area. The focus for impact analysis was based upon resource issues and concerns identified during public scoping. Potential concerns related to development include impacts to groundwater, air quality, and wildlife and cumulative impacts related to ongoing surface coal mining and other proposed development in the Powder River Basin of Wyoming.

Other Environmental Review or Consultation Requirements:

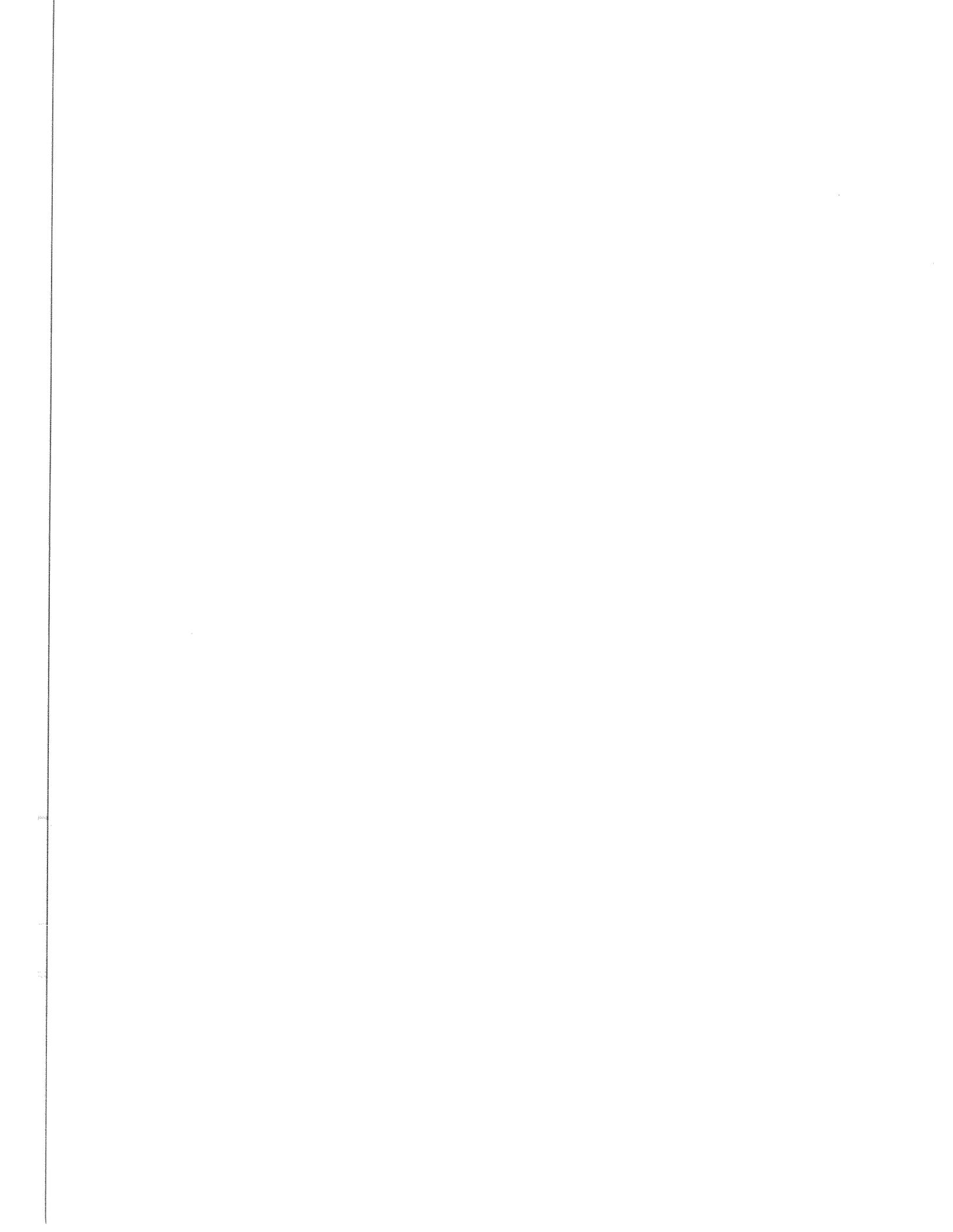
This FEIS, in compliance with Section 7(c) of the Endangered Species Act (as amended), identifies any endangered or threatened species which are likely to be affected by the Proposed Action.

Lead Agency Contact:

For further information contact Nancy Doelger at:
Bureau of Land Management, Casper District Office
1701 East E Street
Casper, WY 82601
(307) 261-7627

Date FEIS Made Available to EPA and Public: February 20, 1998

End of FEIS Availability Period: March 23, 1998



EXECUTIVE SUMMARY

On March 23, 1995, Powder River Coal Company (PRCC) filed an application with the U.S. Department of the Interior-Bureau of Land Management (BLM) for a maintenance coal lease for federal coal reserves located north and west of PRCC's existing North Antelope and Rochelle Mines (Figure ES-1). This coal lease application, which is referred to as the Powder River Lease-By-Application (LBA) Tract, was assigned case file number WYW136142. As applied for, this tract includes approximately 4,020 acres and approximately 515 million tons of federal coal.

On April 14, 1995, Kerr-McGee Coal Corporation (KMCC) filed an application with the BLM for a maintenance coal lease for federal coal reserves located west of and adjacent to KMCC's Jacobs Ranch Mine (Figure ES-2). This coal lease application, which is referred to as the Thundercloud LBA Tract, was assigned case file number WYW136458. As applied for, it includes approximately 3,400 acres and approximately 427 million tons of federal coal. The Thundercloud LBA Tract surrounds 40 acres of surface and coal privately owned by the Atlantic Richfield Company (ARCO)(Figure ES-2). Although this coal is not federally owned, it would be logically mined with the federal coal in the Thundercloud Tract. Therefore, for the purposes of the environmental analysis in this EIS, it is assumed that this private coal will be mined in conjunction with the federal coal in the Thundercloud Tract.

The lands applied for in these two applications are located in southeastern Campbell County, Wyoming. The Thundercloud LBA Tract is located approximately 38 miles southeast of Gillette, Wyoming, approximately 15 miles east of

Wright, Wyoming, and approximately 9 miles north of the Powder River LBA Tract.

These lease applications were reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization, and it was determined that the applications and the lands involved met the requirements of the regulations governing coal leasing on application at Title 43 of the Code of Federal Regulations Part 3425.1 (43 CFR 3425.1). The applications were also reviewed by the Powder River Regional Coal Team (PRRCT) at their public meeting on April 23, 1996, in Cheyenne, Wyoming. At that time, the PRRCT recommended that the BLM process both the Thundercloud and Powder River coal lease applications as LBA's. In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA) by evaluating the environmental impacts of leasing and mining the federal coal.

To evaluate the environmental impacts of leasing and mining the coal, the BLM must prepare an environmental assessment (EA) or an environmental impact statement (EIS) to evaluate the site-specific and cumulative environmental impacts of leasing and developing the federal coal in each application area. The BLM made a decision to prepare one EIS for both of these lease applications.

BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal lease sale for each of the two coal tracts and issue federal coal leases. If the sales are held, the bidding at those sales is open to any qualified bidder; it is not limited to the applicants. If the lease sales are held, a lease would be issued to the

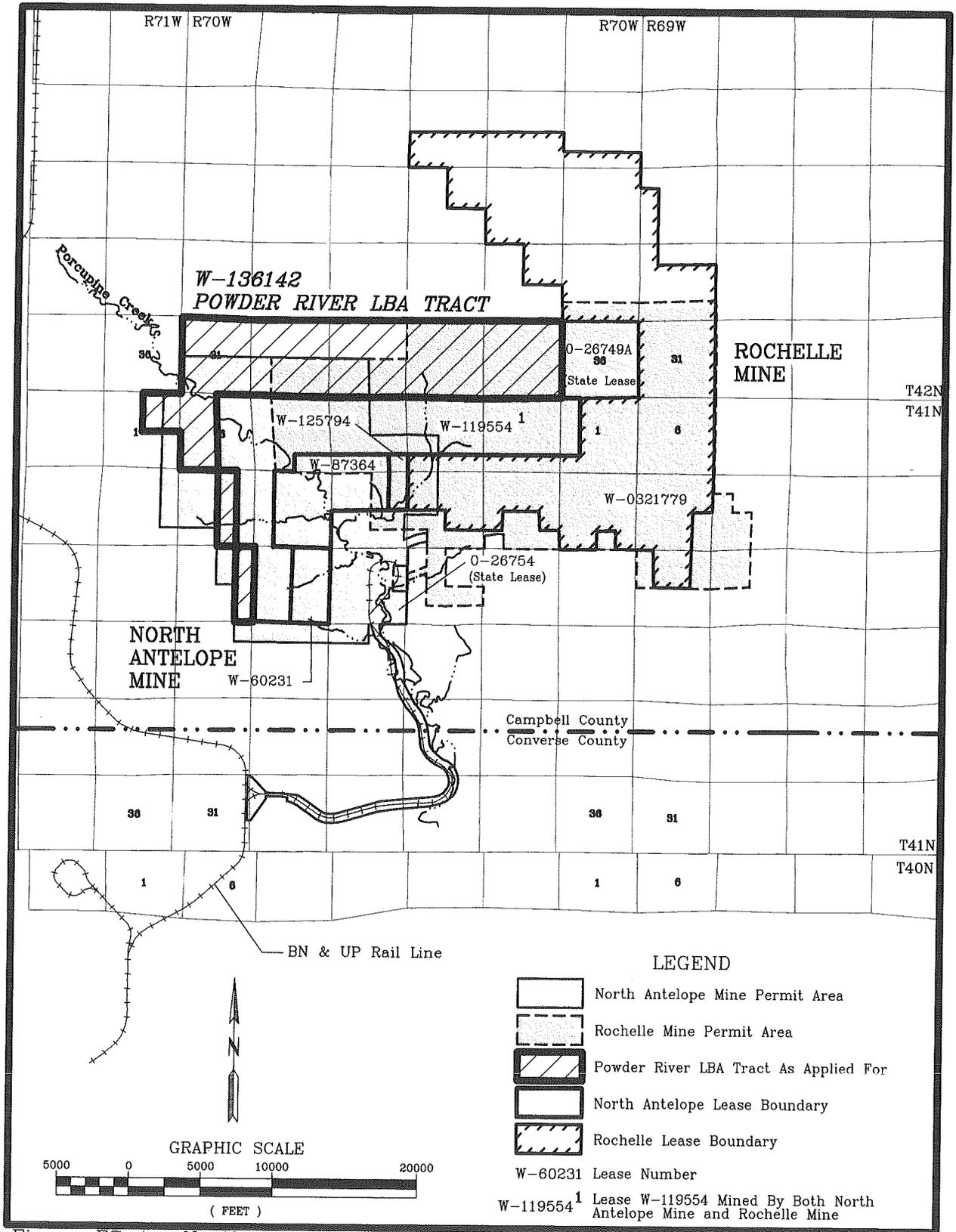


Figure ES-1. North Antelope Mine and Rochelle Mine Coal Leases and the Powder River LBA Tract As Applied For

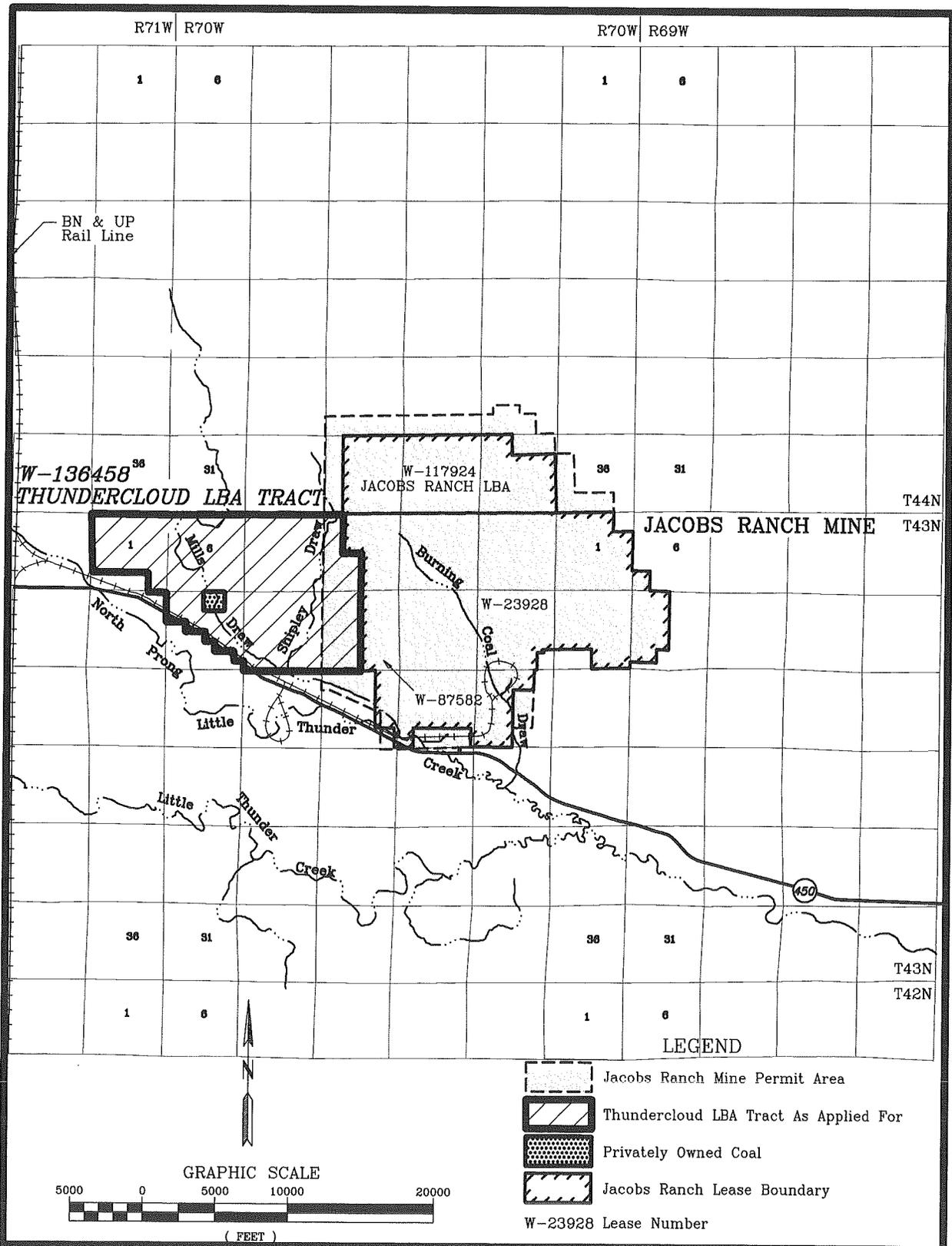


Figure ES-2. Jacobs Ranch Mine Coal Leases and the Thundercloud LBA Tract As Applied For

highest bidder at each sale if a federal sale panel determines that the high bid at that sale meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation, and if the U.S. Department of Justice determines that there are no antitrust violations if a lease is issued to the high bidder at each sale. PRCC and KMCC each previously applied for federal coal under the LBA process, each was the successful high bidder when a competitive lease sale was held, and, in 1992, each was issued a maintenance lease adjacent to these same mines.

Other agencies, including cooperating agencies on this EIS (the U.S. Forest Service [USFS] and the Office of Surface Mining Reclamation and Enforcement [OSM]), will also use this analysis to make decisions related to leasing and mining the federal coal in these tracts.

The lands in both LBA tracts have been subjected to four coal planning screens and determined acceptable for consideration for leasing. A decision to lease the federal coal lands in these applications would be in conformance with both the BLM Resource Management Plan for the Buffalo Resource Area and the USFS Land and Resource Management Plan for the Thunder Basin National Grassland.

As stated previously, the LBA sale process is, by law and regulation, an open, public, competitive sealed-bid process. If separate lease sales are held for these LBA tracts, the applicants (PRCC and KMCC) may not be the successful high bidders. The analysis in this EIS assumes that PRCC will be the successful bidder on the Powder River LBA Tract if a sale is held, and that it will be mined as a maintenance tract for the North Antelope and Rochelle Mines; and that KMCC will be the successful bidder for the

Thundercloud LBA Tract if a sale is held, and that it will be mined as a maintenance tract for the Jacobs Ranch Mine. The Thundercloud LBA Tract is also adjacent to the Black Thunder Mine, operated by Thunder Basin Coal Company (TBCC), and could be mined as a maintenance tract for that mine. If TBCC acquires the tract, the rate of coal production, mining sequence, equipment, and facilities would be different than if KMCC acquires the tract, but the impacts of mining the tract would not substantially alter the environmental analysis conducted in this FEIS.

This FEIS analyzes three alternatives:

The Proposed Action is to hold two separate competitive coal lease sales and issue maintenance leases to the successful bidders (either the applicants or other adjacent existing mines) for the Powder River and Thundercloud LBA tracts as applied for (Figures ES-3 and ES-4).

Alternative 1 is the No Action Alternative. Under this alternative, the LBA tracts would not be leased, but the existing leases at the North Antelope, Rochelle, and Jacobs Ranch Mines would be developed according to the existing approved mining plans for each mine.

Alternative 2 considers holding two separate competitive coal lease sales and issuing maintenance leases to the successful bidders (either the applicant or other adjacent existing mines) for the Powder River and Thundercloud tracts as configured by BLM (Figures ES-3 and ES-4). BLM developed amended tract configurations in order to avoid potential future bypass situations

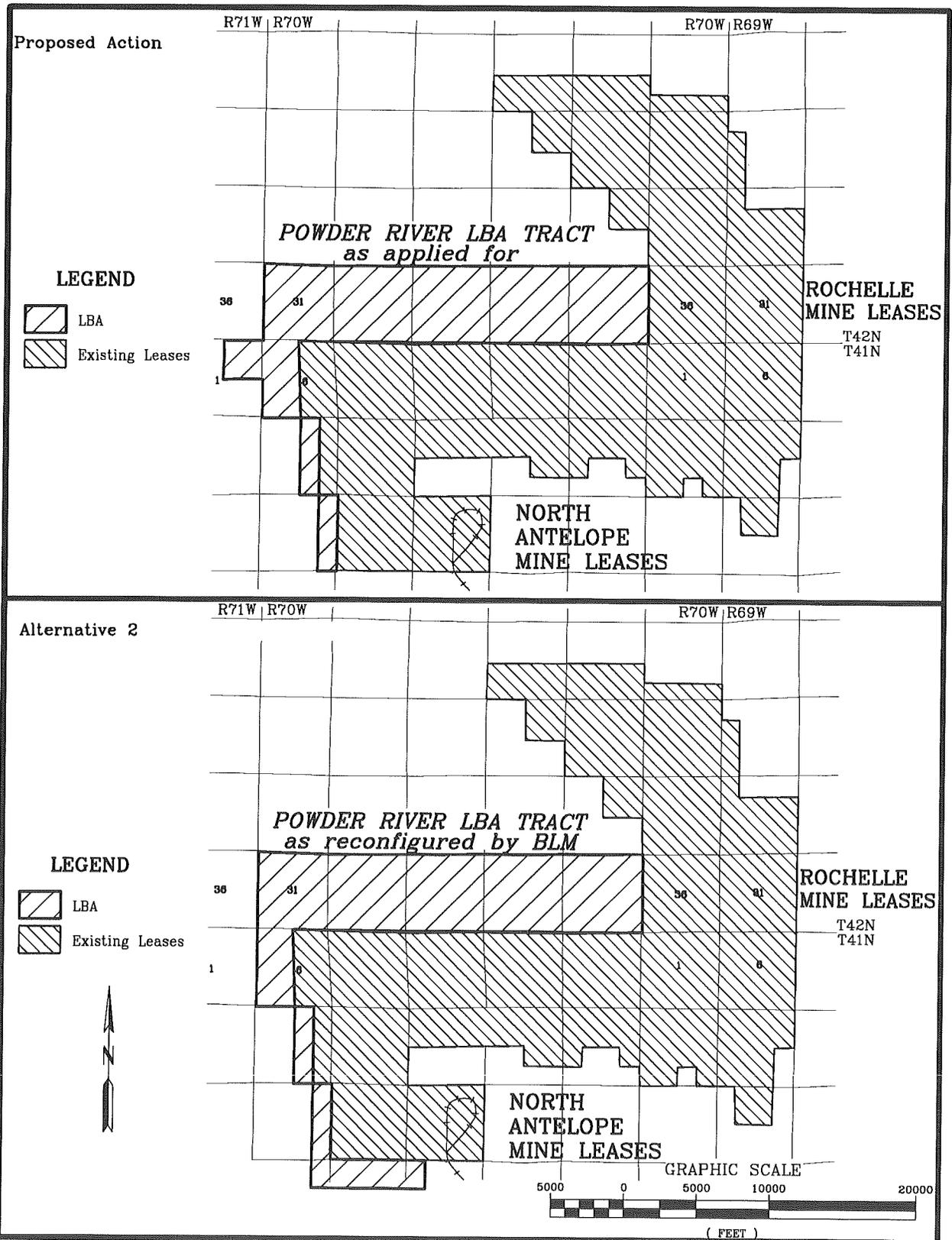


Figure ES-3. Powder River LBA Tract Configurations.

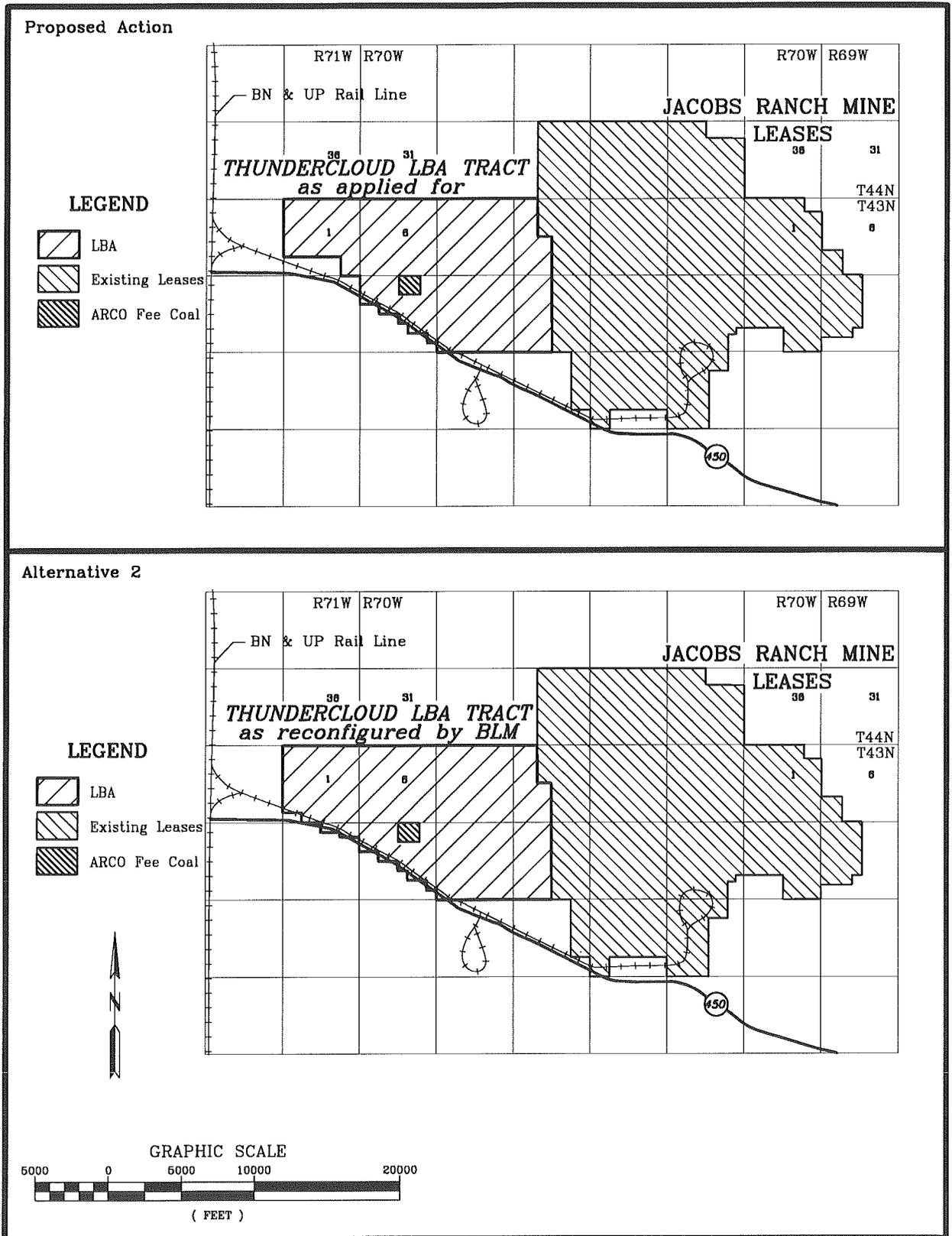


Figure ES-4. Thundercloud LBA Tract Configurations.

and/or to enhance the value of the remaining unleased coal. Under this alternative, the Powder River LBA Tract includes 4,224.225 acres and approximately 532 million tons of federal coal. The amended Thundercloud LBA Tract includes 3,545.503 acres and approximately 432 million tons of federal coal. Alternative 2 is the preferred alternative of the BLM.

Table ES-1 summarizes coal production, surface disturbance, and mine life for the North Antelope and Rochelle Mines under each alternative. Table ES-2 summarizes coal production, surface disturbance and mine life for the Jacobs Ranch Mine under each alternative. The environmental impacts of mining both tracts summarized below would be similar under the Proposed Action and Alternative 2.

Other alternatives that were considered but not analyzed in detail include holding separate competitive coal lease sales and issuing leases to the successful bidders (not the applicant) for the purpose of developing new stand-alone mines; and delaying the competitive sale of one or both LBA tracts.

Critical elements of the human environment (BLM 1988) that could be affected by the proposed project include air quality, cultural resources, Native American religious concerns, threatened, endangered, and candidate (T&E) plant and animal species, hazardous or solid wastes, water quality, and wetlands/riparian zones. USFS Region 2 Sensitive Species could also be affected by the proposed project. Five critical elements (areas of critical environmental concern, floodplains, prime and unique farmland, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical

elements that are potentially present in the project area, the EIS discusses the status and potential effects of the project on topography and physiography, geology and mineral resources, soils, water availability or quantity, alluvial valley floors, wetlands, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

The project area is located in the Powder River Basin (PRB), a part of the Northern Great Plains that includes most of northeastern Wyoming. The LBA tracts are located in the south-central part of the PRB at an elevation of about 4,700 ft in an area of low rolling topography. The main mining objective in both LBA tracts is the Wyodak coal seam. In the Thundercloud LBA Tract, there are up to three mineable coal seams, referred to as the upper, middle, and lower Wyodak. In the Powder River LBA Tract, there is one mineable seam, referred to as the Wyodak in this EIS. The main coal seam on both LBA tracts is 75 feet thick, and overburden ranges from about 150 ft thick at the eastern boundaries of the LBA tracts to over 250 ft on the northern and western boundaries. These overburden and coal thicknesses are similar to the existing leases at the North Antelope, Rochelle, and Jacobs Ranch Mines.

The existing topography on both LBA tracts would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Some spoil and topsoil would be stockpiled for later reclamation, some would be directly placed into the already mined pit. Porcupine Creek (at the Powder River LBA Tract) and Mills and Shipley Draws and North Prong Little Thunder Creek (at the Thundercloud LBA Tract) would be diverted into temporary

Table ES-1. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Powder River LBA Tract, North Antelope and Rochelle Mines.

Item	No Action Alternative (Existing North Antelope/Rochelle Mines)	Added by Proposed Action	Added by Alternative 2
Leased Coal (In place)	1.01 billion tons ¹	515 million tons	532 million tons
Recoverable Coal ^{2,3}	971 million tons	489 million tons	505 million tons
Lease Acres ³	11,434 acres	4,023.5 acres	4,224.2 acres
Total Area To Be Disturbed	11,948 acres	4,626 acres	4,669 acres
Permit Area ⁴	16,217 acres	6,530 acres	6,530 acres
Average Annual Coal Production	65 million tons	none added (65 million tons)	none added (65 million tons)
Life Of Mine	33 years	7.5 years	7.8 years
Average No. Of Employees	640	220	220
Total Projected State Revenues ⁵	\$1.07 billion	\$538 million	\$555 million
Total Projected Federal Revenues ⁶	\$334 million	\$168 million	\$174 million

¹ Does not include 165 million tons of coal in original lease that were never included in the mine permit due to economic factors.

² Assumes 95% recovery of in-place coal reserves, based on operational experience at the North Antelope and Rochelle Mines.

³ Tons and acres provided for life of mine beginning in 1983 for North Antelope Mine and 1985 for Rochelle Mine.

⁴ Includes combined North Antelope and Rochelle Mine Permit Areas, which overlap. Separately, the two permit areas comprise 18,063 acres.

⁵ Projected revenue to the State of Wyoming assumes the State will receive \$1.10 per ton of coal sold (University of Wyoming 1994). Projection includes estimated income to the State from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments.

⁶ Federal Revenues based on a \$4.00/ton price x federal royalty of 12.5% x amount of recoverable coal plus bonus payment of 17.8c/ton based on an average of last 7 LBA's (see Table 1-1) x amount of leased coal less state's 50% share.

Table ES-2. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Thundercloud LBA Tract and Jacobs Ranch Mine

Item	No Action Alternative (Existing Jacobs Ranch Mine)	Added by Proposed Action	Added by Alternative 2
Leased Coal (in place)	538 million tons	427 million tons ¹	432 million tons ²
Recoverable Coal ³	484 million tons	384 million tons	389 million tons
Lease Acres	6,955 acres	3,395.9 acres ⁴	3,545.5 acres ⁴
Total Area To Be Disturbed	8,122 acres	3,749 acres ⁵	3,834 acres ⁵
Permit Area	9,198 acres	3,851 acres ⁵	3,851 acres ⁵
Average Annual Coal Production (1997 forward)	27 million tons	8 million tons (to 35 million tons)	8 million tons (to 35 million tons)
Life Of Mine	30 years	11 years	11.1 years
Average No. Of Employees	350	100	100
Total Projected State Revenues ⁶	\$532 million	\$422 million	\$428 million
Total Projected Federal Revenues ⁷	\$169 million	\$134 million	\$136 million

¹ Excludes the 40-acre coal tract in the NW/4 NE/4 of Section 7 owned by ARCO and 11 million tons beneath the railroad right of way and buffer area.

² Excludes the 40-acre coal tract in the NW/4 NE/4 of Section 7 owned by ARCO and 22 million tons beneath the railroad right of way and buffer area.

³ Assumes 90% recovery of in-place coal reserves.

⁴ Excludes the 40-acre coal tract in the NW/4 NE/4 of Section owned by ARCO

⁵ Includes the 40-acre coal tract in the NW1/4 NE1/4 of Section 7 owned by ARCO.

⁶ Projected revenue to the State of Wyoming assumes the state will receive \$1.10 per ton of coal sold (University of Wyoming 1994). Projection includes estimated income to the State from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments.

⁷ Federal revenues based on a \$4.00/ton price x federal royalty of 12.5% x amount of recoverable coal plus bonus payment of 17.8¢/ton based on an average of last 7 LBA's (see Table 1-1) x amount of leased coal less state's 50% share.

channels or blocked to prevent flooding of the pits. Following reclamation, the average surface elevation would be approximately 43 ft lower at the Thundercloud LBA Tract and 46 ft lower at the Powder River LBA Tract 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 wildlife carrying capacity on the LBA tracts. 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 coal to the land surface would be subject to considerable long-term change on the LBA tracts under either action alternative. Mining would permanently remove the coal. The replaced overburden would be a relatively homogeneous mixture compared to the premining layered overburden.

Consequences to soil resources from mining the LBA tracts 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 topsoils would be much more uniform in type, thickness, and texture. They would be adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Moderately adverse impacts to air quality would occur on the LBA tracts if they are mined. Dust would be visible to the public when mining occurs near Highway 450, Highway 59, and Antelope and Mackey County Roads. Total suspended particulates

(TSP) concentrations would be elevated in the vicinity of mining operations, but would not violate federal or Wyoming primary and secondary standards, even when combined with emissions from adjacent mines. Concentrations of gaseous emissions would remain within acceptable federal and state standards. Federal and state air quality standards have not been exceeded by all existing industrial development in the southeastern PRB, including the existing mines. This is not predicted to change as a result of mining the LBA tracts.

Changes in runoff characteristics and sediment discharges would occur during mining of the LBA tracts, 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 LBA tracts would increase the area of lowered water levels in the coal and overburden aquifers, and the area where the existing coal and overburden aquifers would be replaced by mine backfill. Drawdown in the continuous coal aquifer would be expected to increase roughly in proportion to the increase in area affected by mining, and would extend farther than drawdown in the discontinuous overburden aquifers. The data available indicate that hydraulic properties of the backfill would be comparable to the premining overburden and coal aquifers. Groundwater quality in the backfill can be expected to range from 3,000 to 6,000 mg/L, similar to the premining Wasatch Formation aquifer. This would meet Wyoming Class III standards for use as stock water.

Mining would progressively remove the native vegetation on both LBA tracts. 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 (to be approved by WDEQ). The majority of these species would be native to the LBA tracts. 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 of decreased big game habitat carrying capacity would be associated with this vegetative change. However, a diverse, productive, and permanent vegetative cover would be established on the LBA tracts 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 use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. In areas of the LBA tracts where surface ownership is private, the private landowners would have the right to manipulate the vegetation on their lands as they desire once the final reclamation bond is released.

Mining of the LBA tracts would reduce the acreage of habitat available for wildlife populations; however, the LBA tracts do not contain any unique or crucial big game habitat, and habitat would be disturbed in parcels, with reclamation progressing as new disturbance occurs. 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 LBA tracts would add

to this habitat fragmentation. However, since no defined crucial habitat occurs on the LBA tracts and very little crucial habitat occurs in the highly developed corridor involving area coal mines, these consequences are not expected to cause significant impacts.

USFS Region 2 sensitive species habitat may be directly or indirectly impacted by changing the surface character of the LBA tracts. If the LBA tracts are leased, the USFS will evaluate the tracts for these sensitive species in a Biological Evaluation prior to any habitat manipulation actions when each lessee files an application for a surface mining permit.

Mining the LBA tracts would not be expected to jeopardize the existence of any T&E species, and no known critical habitat for T&E species exists on the LBA tracts.

Active mining would preclude other land uses. During mining and reclamation, the public would not have access to approximately 1,240 acres of federal land on the Thundercloud LBA Tract and approximately 2,675 acres of federal land on the Powder River LBA Tract for hunting or other purposes. Following reclamation, the land would be suitable for grazing and wildlife use, which are the historic land uses. Following reclamation bond release, management of the private surface would return to the private surface owner and management of the federal surface would return to the federal surface managing agency (USFS).

Mining would also impact existing oil and gas development on the leased lands during active mining. There are active oil and gas wells on both LBA tracts. If some or all of these wells on either tract are still producing at the time that coal removal begins, it would

be necessary to remove the equipment associated with those wells and to mine through those wells to recover all of the coal. Before this could occur, the coal lessee and the oil and gas well operator would have to negotiate a mutually acceptable agreement regarding the value of the unrecovered oil and gas resources and/or the cost of re-establishing production after mining and reclamation. 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. Potential for development of coal bed methane resources on the tract would be lost with the removal of the coal.

Cultural resources on the LBA tracts 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. If eligible cultural properties are found within the LBA tracts and they cannot be avoided, a data recovery program would be implemented.

No sites of Native American religious or cultural importance are known to occur on the LBA tracts; if such sites or localities are identified, they will be taken into consideration.

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

The Powder River LBA Tract and most of the Thundercloud LBA tract would not be visible from any major travel routes and would be partly concealed by surrounding

terrain. Some areas of the Thundercloud LBA tract would be visible from State Highway 450. Mining would affect landscapes classified by USFS as "common," and the landscape character would not be significantly changed following reclamation.

Impacts from noise generated by mining activities on the LBA tracts are not expected to be significant due to the remote nature of the site.

No new or reconstructed transportation facilities would be required under the Proposed Action or Alternative 2. Leasing the LBA tracts would extend the length of time that coal is shipped from the permitted North Antelope, Rochelle, and Jacobs Ranch Mines. Active pipelines and utility lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their relocation.

A 1994 University of Wyoming study estimated that the total direct fiscal benefit to the State of Wyoming from coal mining taxes and royalties is \$1.10/ton of coal mined. Using that estimate, the tax and royalty benefit to the State of Wyoming of mining the coal in the LBA tracts under the action alternatives would range from \$960 million to \$983 million. The total economic impact to the local area from direct, indirect and induced effects would range from \$5.24 billion to \$5.37 billion. Mine life, and thus employment, would be extended up to 11.1 years at the Jacobs Ranch Mine and up to 7.8 years at the North Antelope and Rochelle Mines.

Under the No Action Alternative, 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, USFS Region 2 sensitive species, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Jacobs Ranch, North Antelope and Rochelle coal leases, but these impacts would not be extended onto the LBA tracts.

In the case of surface coal mining, the Surface Mining Control and Reclamation Act (SMCRA) and state law require a considerable amount of mitigation and monitoring. If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, then BLM or USFS can include additional mitigation measures as stipulations on a new lease. No mitigation or monitoring measures beyond those required by SMCRA or state law have been identified as necessary for the Powder River or Thundercloud tracts at this time.

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.

Since decertification of the Powder River Federal Coal Region in 1990, the Wyoming State BLM Office has held nine competitive coal lease sales and sold seven federal coal leases containing approximately 1.42 billion tons of coal using the lease-by-application or LBA process. This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office.

The Wyoming BLM has received applications for five federal coal tracts containing approximately 2.0 billion tons of coal, including the Powder River and Thundercloud LBA tracts. The Powder River Regional Coal Team (PRRCT) has reviewed all of these applications and has recommended processing four of them. At a public meeting held in Casper, Wyoming on April 23, 1997, the PRRCT recommended that the BLM not process the New Keeline lease application for a potential new mine start at this time. The BLM Wyoming State Director subsequently rejected that application without prejudice in a decision signed on June 13, 1997. This decision has been appealed. The four pending LBA's recommended for processing include approximately 1.3 billion tons of mineable federal coal.

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996. The purpose of this study was to document actual mineral development impacts in the PRB from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared PRB regional EIS's. The status check was updated prior to the 1997 PRRCT public meeting in Casper.

Four of the previously prepared regional EIS's evaluated coal development in the PRB in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Coal Basin of Wyoming, BLM, October 1974;

Final Environmental Impact Statement, Eastern Powder River Coal, BLM, March 1979;

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.

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*," by Martin and others.

In 1996, Wyoming produced approximately 278.4 million tons of coal, according to the records of the Wyoming State Inspector of Mines. This is almost a three-fold increase since 1980, when 94 million tons of coal was produced in the state. The increasing state production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97% of Wyoming's coal sales.

There are currently 17 operating coal mines in Campbell and northern Converse counties (Figure ES-5). They are located just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth. These mines produce 85% to 95% of the coal produced in Wyoming each year. The actual levels of production from these mines are within the levels predicted in the 1981 EIS. The increasing production will probably result in a continuing demand for federal coal in the Wyoming Powder River Basin, as discussed in the coal leasing demand study that was completed by the BLM Wyoming State Office in 1996 (BLM 1996e). However,

several mines have announced plans to decrease coal production at this time due to the low coal prices.

Oil production has decreased in the Wyoming PRB since 1990. In recent years, more wells have been plugged annually than have been drilled.

Natural gas production in the Wyoming PRB has increased since 1990. The increase is primarily due to the development of shallow coal bed methane resources in the area just west of the coal mines, which was not anticipated in the regional EIS's. Since 1992, five EA's and one EIS have been prepared to analyze the impacts of coal bed methane development projects in the Powder River Basin. Only about half of the oil and gas rights in the area of current coal bed methane development interest are federal; the remainder are private and state. Coal bed methane wells can be drilled on private and state oil and gas leases after approval by the Wyoming Oil and Gas Conservation Commission and the Wyoming State Engineer's Office. Wells cannot be drilled on federal oil and gas leases until the BLM analyzes the individual and cumulative environmental impacts of that drilling, as required by NEPA.

Water and methane are produced from the coal by coal bed methane wells, and the area of coal bed methane development in the PRB is west of the existing coal mines. Therefore, the potential exists for overlapping groundwater drawdown in the coal if both resources are produced. Currently, there is no coal bed methane production in the vicinity of the LBA tracts, but based on current trends, it is likely that development will continue southward in the direction of the LBA tracts and adjacent mines. If coal bed methane is developed adjacent to the six southern mines, the

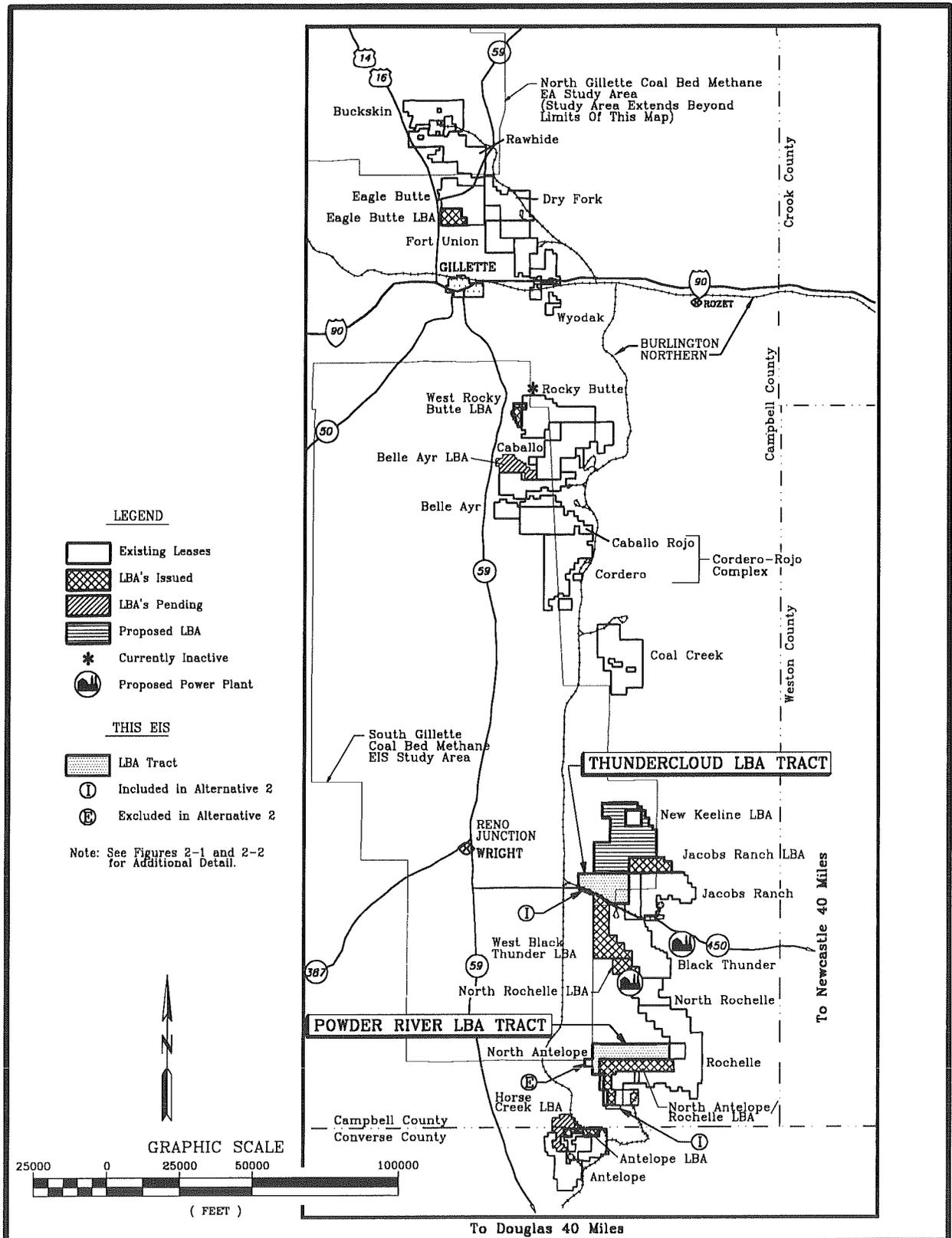


Figure ES-5. Existing and Proposed Federal Coal Leases.

resulting groundwater withdrawal from the Wyodak coal would cause drawdowns that would extend farther to the west and that would overlap additively with groundwater drawdown in the Wyodak Coal caused by coal mining.

Other mineral development levels in the Wyoming PRB are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently three *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. Uranium production has been increasing since 1990. The increase is partially due to higher uranium prices, particularly in 1996 and 1997.

In addition to the ongoing coal mining, the proposed maintenance coal leasing (the Powder River and Thundercloud LBA Tracts considered in this EIS and the Horse Creek LBA Tract), and the potential coal bed methane development, there are four other projects in progress or planned in the vicinity of the southern group of mines: 1) construction of the North Rochelle Mine facilities and rail loop which began in June of 1997; 2) the ENCOAL Plant, which has been proposed within the rail loop at the North Rochelle Mine; 3) the Two Elk Power Plant, which has been proposed east of the Black Thunder Mine; and 4) the construction of the proposed DM&E Railroad line. The ENCOAL and Two Elk projects could commence in 1998; however, the schedule for both projects is tentative. In a recent press release (Ziegler Coal Holding Company, August 29, 1997), it was announced that the construction contract for the plant had been terminated. The DM&E

railroad currently proposes to get the necessary permits and start construction by 1999, and complete a new railroad line in 2001. These projects were proposed independently of the LBA tracts and the schedules for some of these projects are uncertain. They are considered in the cumulative impact analysis because, due to their location, the impacts related to these projects could overlap with the impacts related to mining coal on and in the vicinity of the LBA tracts.

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. This area has already undergone change from a semi-agriculturally based economy to a coal mining and oil and gas economy. Environmentally, the open, basically treeless landscape has been visibly altered by construction, equipment, and human activities. Leasing of the LBA tracts would increase the total area that would be affected by mining but would not cause a significant cumulative change in daily impacts because mining disturbance is progressive, and reclamation proceeds contemporaneously. Cumulative impacts vary by resource and range from being almost undetectable to being substantial. Cumulative impacts on air quality, groundwater quantity and wildlife habitat (particularly antelope) have created the greatest concern. Figure ES-6 shows modeled average annual PM₁₀ concentrations in 2001 at Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, and Rochelle Mines. Figure ES-7 shows modeled and extrapolated worst-case coal aquifer drawdown as a result of mining at these same mines. Monitoring of backfill areas indicates that reclaimed areas are being recharged with water generally suitable for livestock use (the premining use). Wildlife

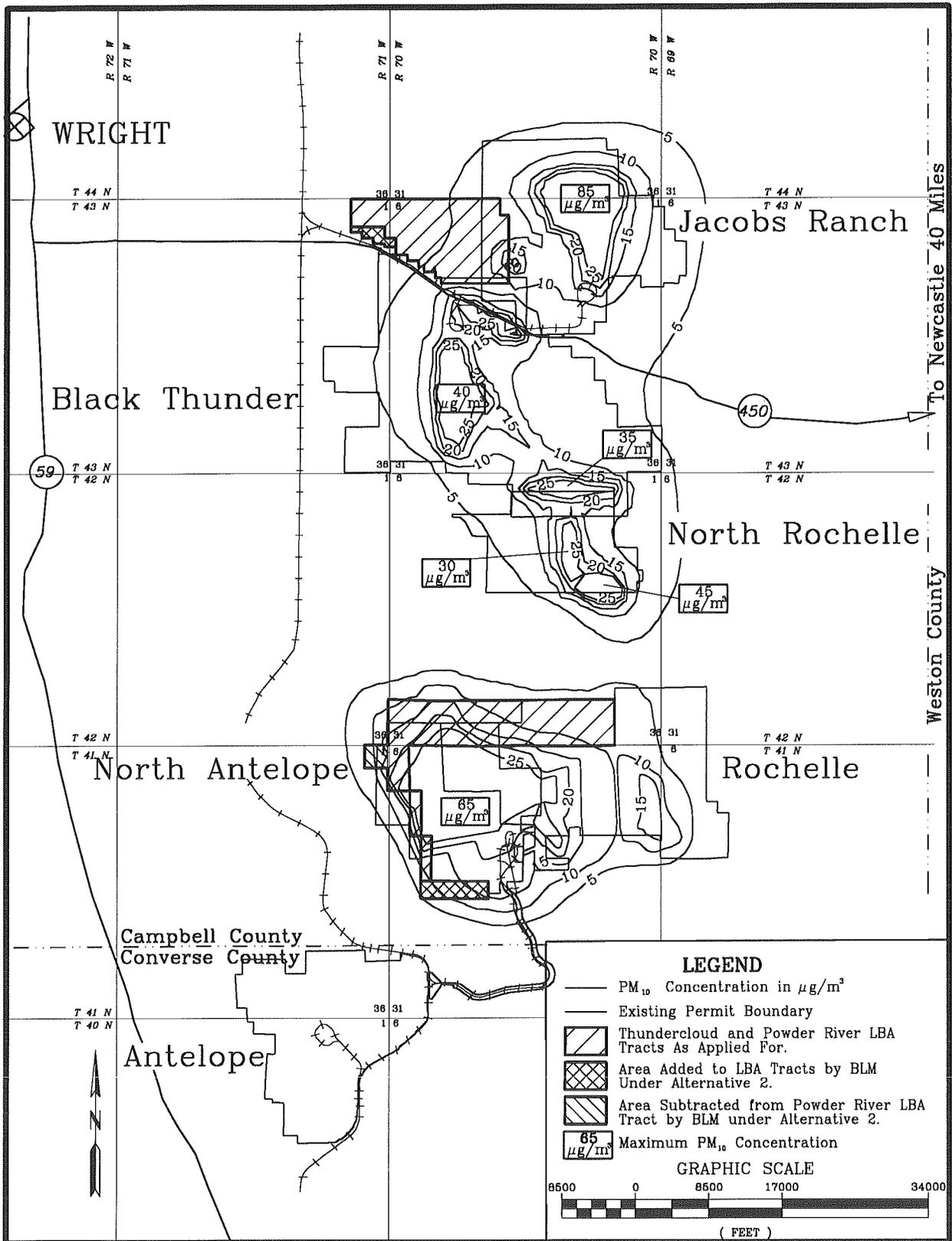


Figure ES-6. Modeled Average Annual PM₁₀ Concentrations in 2001 Resulting from Removal of 140 Million Tons of Coal at Jacobs Ranch, Black Thunder, North Rochelle, North Antelope and Rochelle Mines.

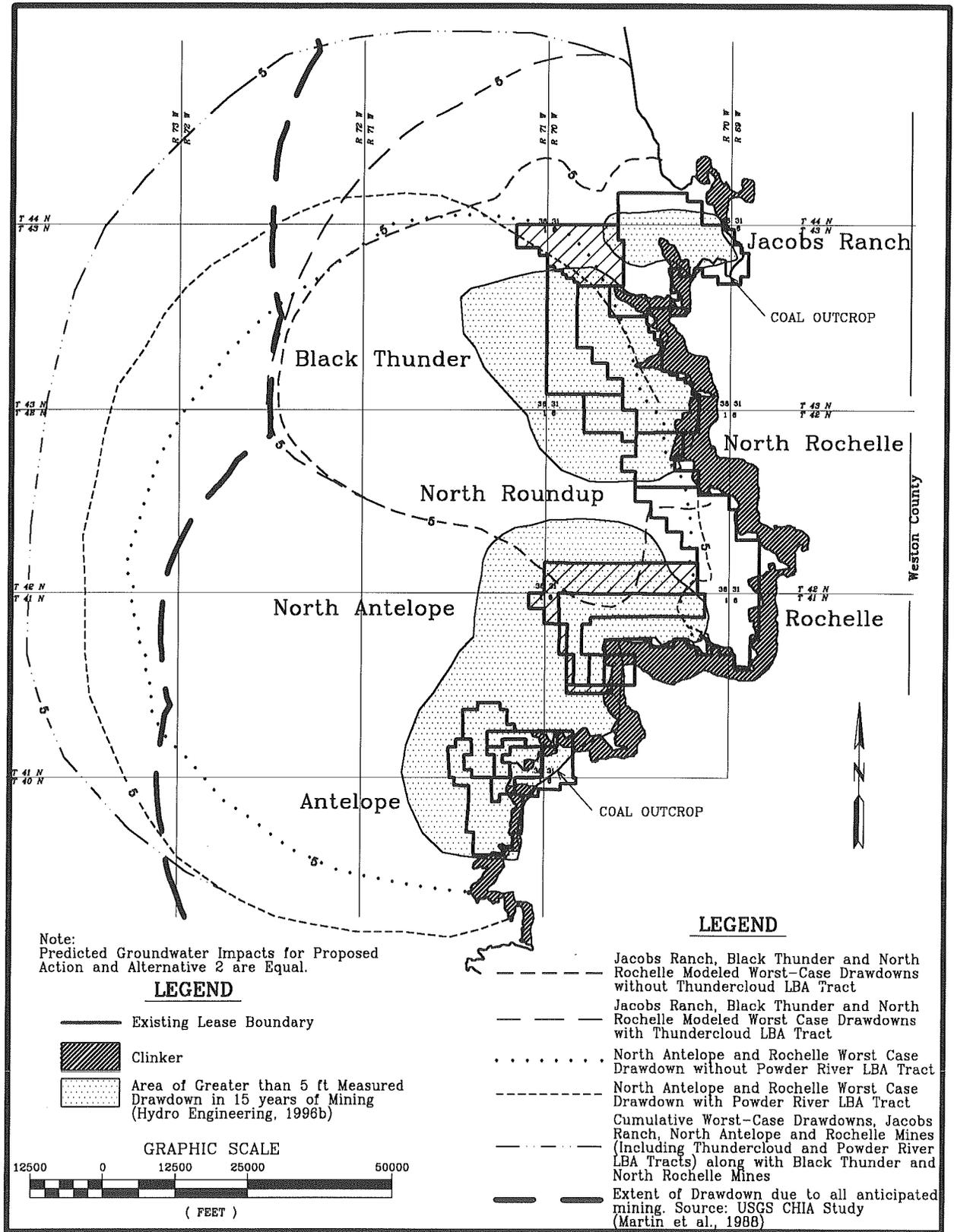


Figure ES-7. Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 15-Year Drawdowns and USGS Predicted Cumulative Drawdowns.

monitoring indicates that wildlife are using reclaimed areas.

This EIS presents the BLM's analysis of environmental impacts under authority of the National Environmental Policy Act (NEPA) and associated rules and guidelines. The BLM will use this analysis to make a leasing decision. The decision to lease these lands is a necessary requisite for mining, but is not in itself the enabling action that will allow mining. The most detailed analysis prior to mine development would occur after the lease is issued, when the lessee files an application for a surface mining permit and mining plan approval, supported by extensive proposed mining and reclamation plans, to the Wyoming Department of Environmental Quality (WDEQ).

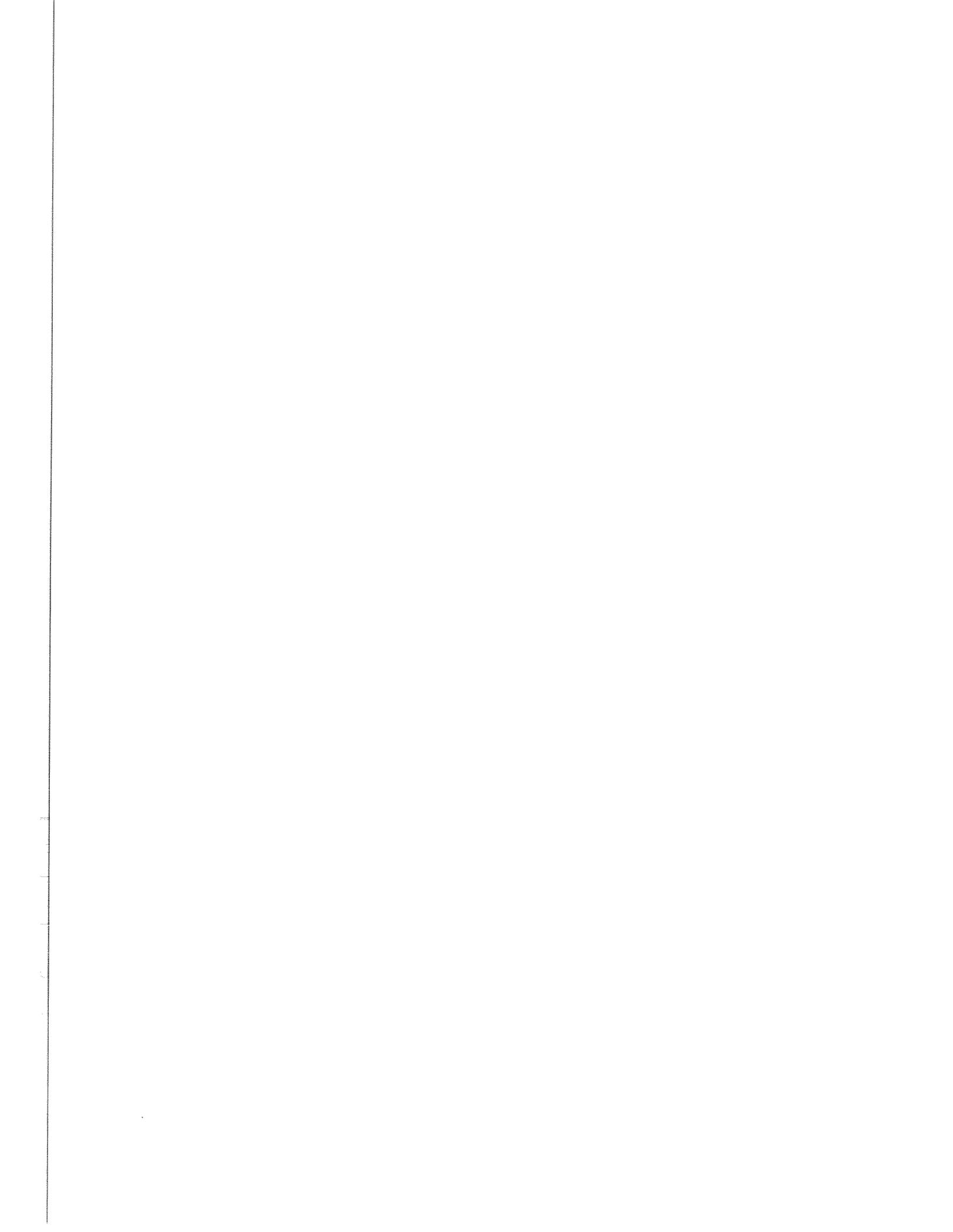


TABLE OF CONTENTS

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1-1

 1.1 Purpose and Need for Action 1-7

 1.2 Regulatory Authority and Responsibility 1-10

 1.3 Relationship to BLM Policies, Plans, and Programs 1-12

 1.4 Conformance with Existing Land Use Plans 1-12

 1.5 Consultation and Coordination 1-13

2.0 PROPOSED ACTION AND ALTERNATIVES 2-1

 2.1 Proposed Action 2-4

 2.2 Alternative 1 2-9

 2.3 Alternative 2 2-9

 2.4 Alternatives Considered but Not Analyzed in Detail 2-10

 2.4.1 Alternative 3 2-10

 2.4.2 Alternative 4 2-11

 2.5 Comparison of Alternatives 2-11

3.0 AFFECTED ENVIRONMENT 3-1

 3.1 General Setting 3-1

 3.2 Topography and Physiography 3-1

 3.3 Geology 3-3

 3.4 Soils 3-10

 3.5 Air Quality 3-12

 3.6 Water Resources 3-17

 3.6.1. Groundwater 3-17

 3.6.2 Surface Water 3-24

 3.6.3 Water Rights 3-28

 3.7 Alluvial Valley Floors 3-29

 3.8 Wetlands 3-30

 3.9 Vegetation 3-31

 3.10 Wildlife 3-35

 3.11 Ownership And Use of Land 3-51

 3.12 Cultural Resources 3-56

 3.13 Native American Consultation 3-59

 3.14 Paleontological Resources 3-60

 3.15 Visual Resources 3-61

 3.16 Noise 3-61

 3.17 Transportation Facilities 3-63

 3.18 Socioeconomics 3-63

 3.18.1 Population 3-66

 3.18.2 Local Economy 3-66

 3.18.3 Employment 3-67

 3.18.4 Housing 3-67

3.18.5	Local Government Facilities and Services	3-68
3.18.6	Social Conditions	3-68
3.18.7	Environmental Justice	3-68
4.0	ENVIRONMENTAL CONSEQUENCES	4-1
4.1	Direct And Indirect Impacts Of Action Alternatives	4-3
4.1.1	Topography and Physiography	4-3
4.1.2	Geology and Minerals	4-4
4.1.3	Soils	4-5
4.1.4	Air Quality	4-5
4.1.5	Water Resources	4-6
4.1.6	Alluvial Valley Floors	4-9
4.1.7	Wetlands	4-9
4.1.8	Vegetation	4-9
4.1.9	Wildlife	4-11
4.1.10	Threatened, Endangered, and Candidate Species	4-14
4.1.11	Land Use and Recreation	4-14
4.1.12	Cultural Resources	4-15
4.1.13	Native American Concerns	4-15
4.1.14	Paleontological Resources	4-15
4.1.15	Visual Resources	4-16
4.1.16	Noise	4-16
4.1.17	Transportation Facilities	4-16
4.1.18	Socioeconomics	4-17
4.1.19	Hazardous and Solid Waste	4-18
4.2	No-Action Alternative	4-19
4.3	Regulatory Compliance, Mitigation, and Monitoring	4-20
4.3.1	Topography and Physiography	4-20
4.3.2	Geology and Minerals	4-20
4.3.3	Soils	4-20
4.3.4	Air Quality	4-20
4.3.5	Water Resources	4-21
4.3.6	Alluvial Valley Floors	4-22
4.3.7	Wetlands	4-22
4.3.8	Vegetation	4-22
4.3.9	Wildlife	4-22
4.3.10	Threatened, Endangered, and Candidate Species	4-23
4.3.11	Land Use and Recreation	4-23
4.3.12	Cultural Resources	4-23
4.3.13	Native American Concerns	4-24
4.3.14	Paleontological Resources	4-24
4.3.15	Visual Resources	4-24
4.3.16	Noise	4-24
4.3.17	Transportation Facilities	4-24
4.3.18	Socioeconomics	4-24
4.4	Residual Impacts	4-24
4.4.1	Topography and Physiography	4-24

Table of Contents

4.4.2	Geology and Minerals	4-24
4.4.3	Soils	4-24
4.4.4	Air Quality	4-24
4.4.5	Water Resources	4-24
4.4.6	Alluvial Valley Floors	4-25
4.4.7	Wetlands	4-25
4.4.8	Vegetation	4-25
4.4.9	Wildlife	4-25
4.4.10	Threatened, Endangered, and Candidate Species	4-25
4.4.11	Land Use and Recreation	4-25
4.4.12	Cultural Resources	4-25
4.4.13	Native American Concerns	4-25
4.4.14	Paleontological Resources	4-25
4.4.15	Visual Resources	4-25
4.4.16	Noise	4-25
4.4.17	Transportation Facilities	4-25
4.4.18	Socioeconomics	4-25
4.5	Cumulative Impacts	4-25
4.5.1	Topography and Physiography	4-33
4.5.2	Geology and Minerals	4-33
4.5.3	Soils	4-34
4.5.4	Air Quality	4-34
4.5.5	Water Resources	4-36
4.5.6	Alluvial Valley Floors	4-46
4.5.7	Wetlands	4-46
4.5.8	Vegetation	4-47
4.5.9	Wildlife	4-48
4.5.10	Threatened, Endangered, and Candidate Species	4-50
4.5.11	Land Use and Recreation	4-50
4.5.12	Cultural Resources	4-51
4.5.13	Native American Concerns	4-52
4.5.14	Paleontological Resources	4-52
4.5.15	Visual Resources	4-52
4.5.16	Noise	4-52
4.5.17	Transportation Facilities	4-53
4.5.18	Socioeconomics	4-53
4.6	The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity	4-55
4.7	Irreversible and Irretrievable Commitments of Resources	4-56
5.0	CONSULTATION AND COORDINATION	5-1
6.0	REFERENCES CITED	6-1

LIST OF TABLES

Table ES-1	Summary Comparison of Coal Production, Surface Disturbance, And Mine Life for Powder River LBA Tract and North Antelope and Rochelle Mines	ES-8
Table ES-2	Summary Comparison of Coal Production, Surface Disturbance, And Mine Life for Thundercloud LBA Tract and Jacobs Ranch Mine	ES-9
Table 1-1	Wyoming Powder River Basin Coal LBA's Sold	1-3
Table 1-2	Pending and Rejected LBA's in the Wyoming Powder River Basin	1-4
Table 2-1	Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Powder River LBA Tract and North Antelope and Rochelle Mines	2-13
Table 2-2	Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Thundercloud LBA Tract and Jacobs Ranch Mine	2-14
Table 2-3	Summary Comparison of Magnitude and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, and the No-Action Alternative for the Thundercloud and Powder River LBA Tracts	2-15
Table 2-4	Summary Comparison of Magnitude and Duration of Cumulative Impacts	2-19
Table 3-1	Acres of Topsoil Available for Reclamation within the Powder River LBA Tract Lease Area and the Entire Area Which Would Be Disturbed by Mining Activities	3-11
Table 3-2	Acres of Topsoil Available for Reclamation within the Thundercloud LBA Tract Lease Area and the Entire Area Which Would Be Disturbed by Mining Activities	3-11
Table 3-3	Regulated Air Emissions for Wyoming	3-12
Table 3-4	Maximum Allowable Increases for Prevention of Significant Deterioration of Air Quality: Particulates	3-15
Table 3-5	Summary of WDEQ/AQD Report on Air Quality Monitoring in Wyoming's Powder River Basin, 1980-1988	3-16
Table 3-6	Acreage Tabulations for Vegetation Types Identified Within the Powder River LBA Tract and the Total Disturbance Area	3-33
Table 3-7	Acreage Tabulations for Vegetation Types Identified Within the Thundercloud LBA Tract and the Total Disturbance Area	3-33
Table 3-8	MBHFI Status in Northeast Wyoming and Expected Occurrence on or near the Powder River LBA Tract	3-42
Table 3-9	MBHFI Status in Northeast Wyoming and Expected Occurrence on or near the Thundercloud LBA Tract	3-49
Table 3-10	Sites Recorded in the Class III Cultural Resource Inventory of the Powder River LBA Tract and Buffer Zone	3-58

Table 3-11	Sites Recorded in the Class III Cultural Resource Inventory of the Thundercloud LBA Tract	3-59
Table 3-12	Fiscal Revenues from Coal Production in Campbell County	3-67
Table 4-1	Comparison of Impacts of Alternative LBA Tracts on Mine Disturbance Area	4-2
Table 4-2	Coal Production & Development Levels, Campbell and Converse Counties, Wyoming	4-29
Table 4-3	Predicted and Actual Coal Mine Disturbance and Reclamation, Campbell and Converse Counties, Wyoming	4-32
Table 5-1	Other Federal, State, and Local Governmental Agencies Consulted In EIS Preparation	5-2
Table 5-2	List of Preparers	5-3
Table 5-3	Distribution List	5-5

LIST OF FIGURES

Figure ES-1	North Antelope Mine and Rochelle Mine Coal Leases and the Powder River LBA Tract As Applied For	ES-2
Figure ES-2	Jacobs Ranch Mine Coal Leases and the Thundercloud LBA as Applied For	ES-3
Figure ES-3	Powder River LBA Tract Configurations	ES-5
Figure ES-4	Thundercloud LBA Tract Configurations	ES-6
Figure ES-5	Existing and Proposed Federal Coal Leases	ES-15
Figure ES-6	Modeled Average Annual PM ₁₀ Concentrations in 2001 Resulting From Removal of 140 Million Tons of Coal at Jacobs Ranch, Black Thunder, North Rochelle, North Antelope and Rochelle Mines	ES-17
Figure ES-7	Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 15-Year Drawdowns and USGS Predicted Cumulative Drawdowns	ES-18
Figure 1-1	General Location Map with Federal Coal Leases	1-2
Figure 1-2	North Antelope Mine and Rochelle Mine Coal Leases and the Powder River LBA Tract As Applied For	1-6
Figure 1-3	Jacobs Ranch Mine Coal Leases and the Thundercloud LBA Tract As Applied For	1-8
Figure 2-1	Powder River LBA Tract Configurations	2-2
Figure 2-2	Thundercloud LBA Tract Configurations	2-3
Figure 3-1	General Analysis Area	3-2
Figure 3-2	North-South and East-West Geologic Cross Section, Thundercloud LBA Tract	3-5
Figure 3-3	North-South and East-West Geologic Cross Section, Powder River LBA Tract	3-6
Figure 3-4	Stratigraphic Relationships and Hydrologic Characteristics of Latest Cretaceous and early Tertiary and Recent periods. Powder River Basin, Wyoming	3-7

Figure 3-5	Wind Rose, Air Quality, and Meteorological Stations at the North Antelope and Rochelle Mines	3-13
Figure 3-6	Wind Rose, Air Quality and Meteorological Station at the Jacobs Ranch Mine	3-14
Figure 3-7	Coal Production vs. Ambient Particulates for Jacobs Ranch, North Antelope and Rochelle Mines	3-18
Figure 3-8	Monitoring Well Locations Within the Powder River LBA Tract .	3-20
Figure 3-9	Monitoring Well Locations Within the Thundercloud LBA Tract .	3-21
Figure 3-10	Surface Water Features Within and Adjacent to the Powder River LBA Tract	3-25
Figure 3-11	Surface Water Features Within and Adjacent to the Thundercloud LBA Tract	3-26
Figure 3-12	Raptor Nest Sites and Sage Grouse Leks Within and Adjacent to the Powder River LBA Tract	3-39
Figure 3-13	Raptor Nest Sites and Sage grouse Leks Within and Adjacent to the Thundercloud LBA Tract	3-47
Figure 3-14	Surface Ownership Within the Powder River LBA Tract	3-52
Figure 3-15	Surface Ownership Within the Thundercloud LBA Tract	3-53
Figure 3-16	Relationship Between A-scale Decibel Readings and Sounds of Daily Life	3-62
Figure 3-17	Transportation Facilities Within and Adjacent to the Powder River LBA Tract	3-64
Figure 3-18	Transportation Facilities Within and Adjacent to the Thundercloud LBA Tract	3-65
Figure 4-1	Existing and Proposed Federal Coal Leases	4-28
Figure 4-2	Modeled Average Annual PM ₁₀ Concentrations in 2001 Resulting from Removal of 140 Million Tons of Coal at Jacobs Ranch, Black Thunder, North Rochelle, North Antelope and Rochelle Mines . .	4-35
Figure 4-3	Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 15-Year Drawdowns and USGS Predicted Cumulative Drawdowns	4-40

LISTS OF APPENDICES

Appendix A.	Federal and State Permitting Requirements and Agencies
Appendix B.	Unsuitability Criteria for the Powder River and Thundercloud LBA Tracts
Appendix C.	Coal Lease-by-Application Flow Chart
Appendix D.	BLM Special Coal Lease Stipulations, Forest Service Stipulation, and Form 3400-12 Coal Lease
Appendix E.	Groundwater Rights Affected by the North Antelope and Rochelle Mines
Appendix F.	U.S. Forest Service, Region 2, Sensitive Species
Appendix G.	Selected Plates from "A Study of Techniques to Assess Surface and Groundwater Impacts Associated with Coal Bed Methane and Surface Coal Mining, Little Thunder Creek Drainage, Wyoming"
Appendix H.	Comment Letters and Responses

1.0 INTRODUCTION

On March 23, 1995, Powder River Coal Company (PRCC) filed an application with the U.S. Department of the Interior-Bureau of Land Management (BLM) for a maintenance coal lease for federal coal reserves located north and west of PRCC's existing North Antelope and Rochelle Mines. This coal lease application, which is referred to as the Powder River Lease-By-Application (LBA) Tract, was assigned case file number WYW136142. On April 14, 1995, Kerr-McGee Coal Corporation (KMCC) filed an application with the BLM for a maintenance coal lease for federal coal reserves located west of and adjacent to KMCC's Jacobs Ranch Mine. This coal lease application, which is referred to as the Thundercloud LBA Tract, was assigned case file number WYW136458. The lands applied for in these two applications are located in southeastern Campbell County, Wyoming. The Thundercloud LBA Tract is located approximately 38 miles southeast of Gillette, Wyoming, approximately 15 miles east of Wright, Wyoming, and approximately 9 miles north of the Powder River LBA Tract (Figure 1-1).

These lease applications were reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization, and it was determined that the applications and the lands involved met the requirements of the regulations governing coal leasing on application under Title 43 of the Code of Federal Regulations Part 3425.1 (43 CFR 3425.1).

Since these federal coal lands are within the decertified Powder River Federal Coal Region, the applications were also reviewed by the Powder River Regional Coal Team (PRRCT) at their public meeting on April 23, 1996, in Cheyenne, Wyoming. The PRRCT

is a federal/state advisory board established to develop recommendations concerning management of federal coal in the region. Although the Powder River Federal Coal Region was decertified in January 1990, the PRRCT has retained oversight of the federal coal leasing activities in the region. Since decertification, seven successful lease sales have been held in the Wyoming portion of the Powder River Federal Coal Region (Table 1-1). Five additional applications, including the Powder River and Thundercloud applications, are pending or have been rejected (Table 1-2).

At their 1996 meeting, the PRRCT recommended that the BLM process both the Thundercloud and Powder River coal lease applications as LBA's. In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA) by evaluating the environmental impacts of leasing and mining the federal coal.

To evaluate the environmental impacts of leasing and mining the coal, the BLM must prepare an environmental assessment (EA) or an environmental impact statement (EIS) to evaluate the site-specific and cumulative environmental impacts of leasing and developing the federal coal in each application area. The PRRCT recommended that BLM request comments from the public during the scoping process on whether NEPA would best be satisfied by preparing separate NEPA documents for each lease application or by preparing one NEPA document for both lease applications. Scoping for both applications was conducted in July 1996. After reviewing the requirements of NEPA and the scoping comments, the BLM Wyoming State Director, who is also the

Table 1-1. Lease-by-Applications (LBA's) Sold in the Wyoming Powder River Basin

LBA LEASE NO. AND APPLICANT	APPLICATION DATE	AS APPLIED FOR ESTIMATED LEASE SIZE & COAL TONNAGE	STATUS	AS OFFERED LEASE SIZE & EST. TONS OF MINEABLE*** COAL	SALE INFORMATION***	AVERAGE COAL QUALITY DATA FROM LEASE SALE NOTICE
JACOBS RANCH WYW117924 Jacobis Ranch Mine Kerr-McGee	10/10/89	1465.16 Acres 123 MM Tons	Sale held 9/26/91-Bid Accepted Lease effective-10/1/92; Unsuccessful IBLA appeal PRBRC*/WOC*/Sierra Club	1708.62 Acres 147,423,560 Tons	1 bid-\$20,114,930 \$11,772.62/acre \$0.136/ton Bid Accepted	Btu/lb=8540, Ash=5.4%, Sulfur=0.47%, Strip Ratio=2.46 BCY**/ton
WEST BLACK THUNDER WYW118907 Black Thunder Mine Thunder Basin Coal Co.	12/22/89	3225 Acres 400 MM Tons	Sale held 8/12/92-Bid Accepted Lease effective-10/1/92	3492.495 Acres 429,048,216 Tons	1 bid-\$71,909,282.69 \$20,589.66/acre \$0.168/ton Bid Accepted	Btu/lb=8839, Ash=4.40%, Sulfur=0.25%, Strip Ratio=2.72 BCY**/ton
NORTH ANTELOPE/ ROCHELLE WYW119554 North Antelope Mine & Rochelle Mine Powder River Coal Co.	3/2/90 two applications	North Antelope: 954 Acres 120 MM Tons Rochelle: 1196 Acres 150 MM Tons	Sale held 9/28/92-Bid Accepted Lease effective-10/1/92	Offered as One Tract: 3064.04 Acres 403,500,000 Tons	1 bid-\$86,987,765 \$28,389.89/acre \$0.216/ton Bid Accepted	N. Antelope: Btu/lb=8804, Ash=4.28%, Sulfur=0.35% Strip Ratio=2.29 BCY**/ton Rochelle: Btu/lb=8700 Ash=4.31%, Sulfur=0.13% Strip Ratio=2.16 BCY**/ton Upper Coal(98% of coal)
WEST ROCKY BUTTE WYW122586 Proposed Rocky Butte Mine Northwestern Resources Co.	12/4/90	390 Acres 50 MM Tons	12/3/92 Sale-Bid rejected 1/7/93 Sale-Bid accepted Unsuccessful IBLA appeal by PRBRC* Lease effective 1/1/93	463,205 Acres 56,700,000 Tons	12/3/92, 1 bid-\$14,200,000 \$30,603.45/acre \$0.258/ton Bid Rejected 1/7/93, 1 bid-\$16,500,000 \$35,621.38/acre \$0.291 cents/ton Bid Accepted	Btu/lb=8354 Ash=4.30%, Sulfur=0.27% Average Overall Strip Ratio=3.75BCY**/ton
EAGLE BUTTE WYW124783 Eagle Butte Mine AMAX Land Co.	7/25/91	915 Acres 150 MM Tons	Sale held 4/5/95-Bid Accepted Lease effective 8/1/95	1059,175 acres 166,400,000 Tons	1 bid-\$18,470,400 \$17,438.48/acre \$0.111/ton Bid Accepted	Upper Coal: Btu/lb=8434 Ash=4.95%, Sulfur=0.54% Lower Coal: Btu/lb=8431 Ash=4.23%, Sulfur=0.22% Strip Ratio=1.99BCY**/ton
ANTELOPE WYW128322 Antelope Mine Antelope Coal Co.	12/29/92	617.2 Acres 60 MM Tons	Sale Held 9/18/96-Bid Rejected Sale Held 12/4/96-Bid Accepted Lease Effective 2/1/97	617.2 Acres (462 Acres Mineable) 60,364,000 Tons (Andersons-31.9MM T) (Canyon-28.4MM T)	9/18/96-1 bid: \$6,645,045.10 \$10,766.44/Acre; \$0.1101/ton Bid Rejected 12/4/96--1 bid: \$9,054,600 \$14,670.45/acre;\$0.150/ton (\$19,590/Mineable Acre); Bid Accepted	Btu/lb=8779 Ash=4.22%, Sulfur= .23% Moist=25.7%, Na=1.21% Strip Ratio Range = 0.5 to 4.1 BCY**/ton
NORTH ROCHELLE WYW127221 North Rochelle Mine Zeigler Coal Co.	7/22/92	1440 Acres 144 MM tons	Sale held 7/29/97, bid rejected Sale held 9/25/97, bid accepted Lease effective 01/01/98	1481.99 Acres 157,610,000 Tons	7/29/97-1 bid-\$26,800,501 \$18,086.86/acre, \$0.17/ton Bid Rejected 9/25/97-1 bid-\$30,576,340 \$20,632/acre-\$0.194/ton Bid Accepted	Btu/lb=8680 Ash=4.91%, Sulfur=0.23% Moisture=27.72% Strip Ratio=2.91 BCY**/ton

TOTAL BONUS: \$253,613,317.69; ESTIMATED TONS OF MINEABLE COAL LEASED: 1,421,045,776; TOTAL ACRES: 11,886,665

**PRBRC= Powder River Basin Resource Council, WOC= Wyoming Outdoor Council, DEIS= Draft Environmental Impact Statement, FEIS= Final Environmental Impact Statement, ROD= Record of Decision

***BCY = Bank Cubic Yards

***Estimated mineable tons of coal, as reported on the sale notice. Mineable tons of coal are assumed to be the same as in place tons of coal unless reported differently in the sale notice. Bonus received per ton is calculated using mineable tons of coal.

Table 1-2. Pending & Rejected Coal Lease-by-Applications (LBA's) in the Wyoming Powder River Basin

LBA LEASE NO. AND APPLICANT	APPLICATION DATE	AS APPLIED FOR ESTIMATED LEASE SIZE, TONNAGE, and LEASE TYPE	STATUS	AS OFFERED LEASE SIZE & EST. TONS OF MINEABLE COAL	SALE INFORMATION	AVERAGE COAL QUALITY DATA FROM LEASE SALE NOTICE
PENDING						
POWDER RIVER WYWI36142 North Antelope Mine & Rochelle Mine Powder River Coal Co.	3/23/95	4023 Acres 515 MM Tons Maintenance	Scoping Meeting 6/27/96 Gillette; DEIS* prepared jointly with Thundercloud, mailed 8/97; Hearing 10/8/97 in Gillette			
THUNDERCLOUD WYWI36458 Jacobs Ranch Mine Kerr-McGee Coal Corp.	4/14/95	3396 Acres 427 MM Tons Maintenance	Scoping Meeting 6/27/96 Gillette; DEIS* prepared jointly with Powder River, mailed 8/97; Hearing 10/8/97 in Gillette			
HORSE CREEK WYWI41435 Antelope Mine Antelope Coal Company	2/14/97	1,471 Acres 177.5 MM Tons Maintenance	PRRCT*** reviewed 4/23/97, recommended that BLM process; Scoping 11/1/97 - 11/30/97 Scoping Meeting 11/13/97 Gillette			
BELLE AYR WYWI41568 Belle Ayr Mine Amax Land Co.	3/20/97	1,579 Acres 200 MM Tons Maintenance	PRRCT*** Reviewed 4/23/97 recommended that BLM process			
TOTAL PENDING: 1.3195 BILLION TONS OF COAL UNDER 10,469.07 ACRES						
REJECTED						
NEW KEELINE WYWI38975 Proposed New Mine Evergreen Enterprises	5/13/96	7,841 Acres 675 MM Tons New Start Mine	PRRCT*** reviewed 4/23/97, recommended that this LBA not be considered for future processing at this time; Wyoming State Director rejected without prejudice 6/13/97; Rejection Decision Appealed 7/14/97			
TOTAL REJECTED: 0.675 BILLION TONS OF COAL UNDER 7,841 ACRES						

*DEIS = Draft Environmental Impact Statement, FEIS = Final Environmental Impact Statement, ROD = Record of Decision

**BCY = Bank Cubic Yards

***PRRCT = Powder River Regional Coal Team

Chairman of the PRRCT, made a decision to prepare one EIS for the two lease applications.

BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal lease sale for each of the two coal tracts and issue federal coal leases. If the sales are held, the bidding at those sales is open to any qualified bidder; it is not limited to the applicants. If the lease sales are held, a lease will be issued to the highest bidder at each sale if a federal sale panel determines that the high bid at that sale meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation and if the U.S. Department of Justice determines that there are no antitrust violations if a lease is issued to the high bidder at each sale. PRCC and KMCC each previously applied for federal coal under the LBA process, each was the successful high bidder when a competitive lease sale was held, and, in 1992, each was issued a maintenance lease adjacent to these same mines (see Jacobs Ranch and North Antelope/Rochelle LBA's, Figure 1-1 and Table 1-1).

Other agencies, including cooperating agencies on this EIS (the U.S. Forest Service [USFS] and the Office of Surface Mining Reclamation and Enforcement [OSM]), will also use this analysis to make decisions related to leasing and mining the federal coal in these tracts.

Powder River LBA Tract

The Powder River LBA Tract includes approximately 4,023 acres and contains approximately 515 million tons of mineable coal. The Powder River LBA Tract as applied for and the existing federal coal leases in the adjacent North Antelope and Rochelle Mines are shown in Figure 1-2.

If PRCC acquires a federal coal lease for these lands, the coal will be mined, processed, and distributed as part of PRCC's permitted North Antelope Mine, which comprises 7,152 acres and originally contained 359 million tons of mineable coal, and Rochelle Mine, which comprises 10,910 acres and originally contained 817 million tons (652 million tons permitted and 165 million tons unpermitted) of mineable coal.

The Powder River LBA Tract is contiguous with the North Antelope and Rochelle Mines. The area applied for is substantially similar to the adjacent mines for which detailed site-specific environmental data have been collected and for which environmental analyses have previously been prepared to secure the existing leases and the necessary mining permits.

The surface of the Powder River LBA Tract is owned by the State of Wyoming, the United States of America, PRCC, the Bridle Bit Ranch Company, and the Dilts Brothers. The federally owned surface is part of the Thunder Basin National Grassland, administered by the USFS.

As applied for, the Powder River LBA Tract coal resources would be mined as a maintenance tract to extend mine life at the North Antelope Mine and the Rochelle Mine. The mining method would be a combination of truck and shovel and dragline, which are the mining methods currently in use at these two mines.

After mining, the land would be reclaimed for livestock grazing and wildlife use as is the current practice at the North Antelope and Rochelle Mines.

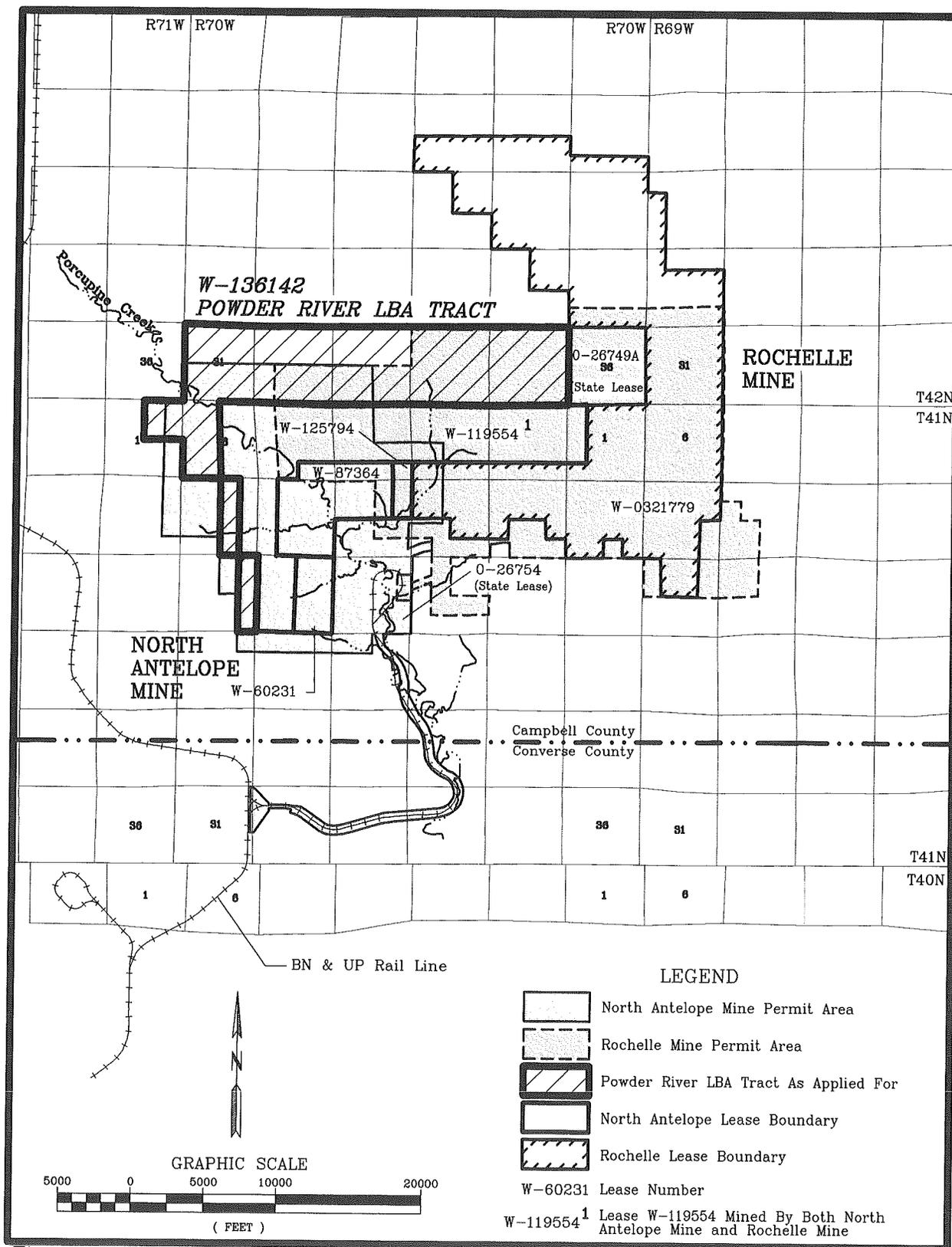


Figure 1-2. North Antelope Mine and Rochelle Mine Coal Leases and the Powder River LBA Tract As Applied For

Thundercloud LBA Tract

The Thundercloud Tract includes approximately 3,396 acres and contains approximately 427 million tons of mineable coal. A 40-acre tract of privately owned coal located inside the tract boundaries containing approximately 5 million tons of mineable coal is excluded from this acreage (and the estimate of mineable coal reserves). This private coal is not included in the tract that would be leased by the federal government, and it is not included in the calculations of federal royalty payments. For the purpose of the impact analysis in this EIS, however, it is assumed that if there is a competitive sale, the successful bidder will obtain the mining rights from the private coal owner and this coal will be mined with the federal coal in the Thundercloud LBA Tract. The Thundercloud LBA Tract as applied for and the existing federal coal leases in the adjacent Jacobs Ranch Mine are shown in Figure 1-3.

The Thundercloud LBA Tract is contiguous with both the Jacobs Ranch Mine and the Black Thunder Mine, operated by the Thunder Basin Coal Company, a subsidiary of ARCO (Figure 1-1). The current Thundercloud LBA Tract is part of a tract that was previously delineated for potential sale in a proposed 1984 federal coal sale that did not take place. The original Thundercloud Tract is described in a 1983 BLM document entitled "Powder River Coal Region Tract Summaries".

The area applied for is substantially similar to the adjacent mines for which detailed site-specific environmental data have been collected and for which environmental analyses have previously been prepared to secure the existing leases and the necessary mining permits. If KMCC acquires the federal coal lease for these lands, the coal would be mined, processed, and distributed

as part of KMCC's permitted Jacobs Ranch Mine, which comprises 9,198 acres and prior to mining contained 538 million tons of leased coal.

Currently, the surface of the Thundercloud LBA Tract is owned by the United States of America, KMCC, Atlantic Richfield, and the Gladys K. Norwood estate. The federally owned land is part of the Thunder Basin National Grassland, administered by the USFS. Current land uses of the area within the tract include grazing by domestic animals and wildlife and oil and gas production.

The proposed addition of the coal in the Thundercloud LBA Tract would allow KMCC to maintain and expand existing contracts and would extend the life of the current mining operations. The Jacobs Ranch Mine is a truck and shovel surface mining operation, and the Thundercloud Tract would be mined using this same mining method if KMCC acquires the tract. The coal would be used primarily for electric power generation, which is the primary use of the coal in the existing mine.

After mining, the land would be reclaimed for livestock grazing and wildlife use as is the current practice at the Jacobs Ranch Mine.

1.1 Purpose and Need for Action

Under the original homestead laws, ranchers and farmers were granted both the surface and mineral rights to their land. The homestead laws were amended in the early 1900's to convey only the surface rights to private parties, while the federal government began to retain the subsurface mineral rights. Since the passage of the Mineral Leasing Act in 1920, the U.S. Department of the Interior (USDI), through its implementing agency the BLM, has been charged with administering a

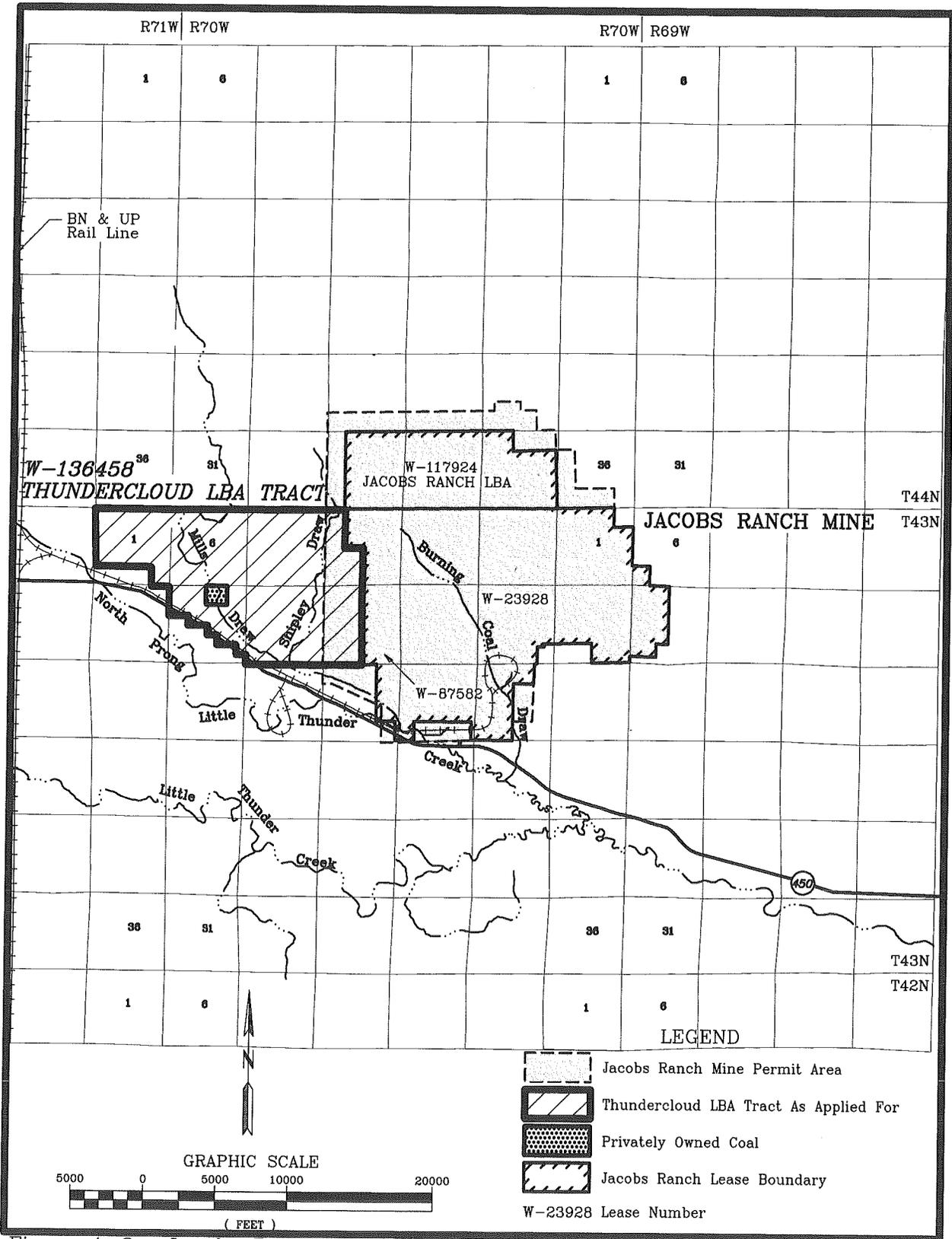


Figure 1-3. Jacobs Ranch Mine Coal Leases and the Thundercloud LBA Tract As Applied For

leasing program that would allow the private sector to mine federally owned coal reserves. A federal coal lease grants the lessee the exclusive right to obtain a mining permit for, and to mine coal on, the leased tract subject to the terms of the lease, the mining permit, and applicable state and federal laws. In return for receiving a lease, a lessee must make a bonus payment to the federal government when the coal is leased, make annual rental payments to the federal government, and make royalty payments to the federal government when the coal is mined. Federal bonus and royalty payments are split with the state in which the lease is located.

The federal coal leasing program allows for the designation of new production tracts (a lease to open a new mine), bypass tracts (a lease needed to prevent leaving "islands" of unmined coal), and maintenance tracts (a lease needed to continue operations at an existing mine). The leasing program provides for competitive leasing of federal coal to promote the timely and orderly development of publicly owned coal resources.

PRCC currently has 204 million tons of permitted recoverable coal left at the North Antelope Mine and 461 million tons of permitted recoverable coal at the Rochelle Mine. It would take approximately 10 years to mine this combined total of 665 million tons of recoverable coal, if it was mined at the combined permitted rate of 65 million tons per year. However, PRCC's evaluation of this remaining leased reserve has indicated that not all of this permitted recoverable coal is marketable due to problems with the quality of some of the coal. Approximately 310 million tons of the currently leased recoverable coal could not be marketed without blending with higher quality reserves. PRCC intends to combine the

higher quality coal in the Powder River LBA Tract with this lower quality coal to produce a marketable product. Without the additional reserves in the Powder River LBA Tract, PRCC may not be able to sell all of this 310 million tons of currently leased recoverable coal. By blending high quality and low quality coal at the planned combined production rate of 65 million tons per year, PRCC anticipates that the available leased high quality reserves would be exhausted in 2002 or 2003. If additional high quality reserves are not leased and permitted by this time, about 245 million tons of low quality coal that could not be blended to meet customer specifications could be left in the ground.

The Rochelle Mine was originally permitted to supply coal to the proposed WyoCoal Gas Project in Douglas, Wyoming for 40 years at 11.0 million tons per year from federal coal lease WYW-0321779. The northern part of lease WYW-0321779 (see Figure 1-2) was not permitted because the coal in that part of the lease was not marketable at the time due to low calorific values and unattractive overburden-to-coal ratios. The unpermitted reserves are also located a great distance from the existing coal crushing and loading facilities, which reduces the feasibility of mining the coal with the existing Rochelle Mine facilities. As a result, the company envisioned developing a new mine facility in the northern section of the lease with a new railroad loop and loading facilities if a market developed for that coal.

Through the years, coal quality has become an even larger issue than it was in the early 1980's. Today utilities are demanding a high Btu, low sulfur product with tight requirements on sodium. The low Btu, high sodium content of the unpermitted reserves is even less attractive in today's market. For all of these reasons, PRCC made the business

decision to apply for quality marketable reserves closer to the existing infrastructure and hold the currently unmarketable unpermitted coal for future mining.

PRCC applied for the coal reserves in the Powder River LBA Tract so they could negotiate new coal contracts to replace existing contracts. If they acquire the lease, they propose to blend the coal from the LBA tract with lower quality reserves in the existing permit area to fulfill quality requirements in existing and future contracts. In order to mine the lower quality unpermitted portion of lease WYW-0321779 in the future, the company anticipates that they will need to lease additional high quality reserves for the purpose of blending to meet market quality requirements.

It has been projected that the passage of the 1990 Clean Air Act Amendments, with incentives for use of low-sulfur coal, will lead to increased demand for Powder River Basin (PRB) coal, and coal production has steadily increased in the PRB since 1992. If the LBA tracts are leased to the applicants as maintenance tracts, the permit areas for the adjacent mines would have to be amended to include the new lease areas before they can be disturbed. This process takes several years to complete. PRCC and KMCC are applying for federal coal reserves now so that they can negotiate new contracts and then complete the permitting process in time to meet these new contract requirements.

This EIS analyzes the environmental impacts of issuing federal coal leases and mining the federal coal in the PRCC and KMCC lease applications as required by NEPA and associated rules and guidelines. The decision to hold competitive sales and issue leases for the lands in these applications is a prerequisite for mining the Thundercloud LBA Tract and the Powder River LBA Tract

but is not in itself the enabling action that will allow mining, as discussed above. The most detailed analysis occurs after a lease has been issued but prior to mine development, when the lessee files a permit application package with the Land Quality Division (LQD) of the Wyoming Department of Environmental Quality (WDEQ) and OSM for a surface mining permit and approval of the mining plan. Authorities and responsibilities of the BLM and other concerned regulatory agencies are described in the following sections.

1.2 Regulatory Authority and Responsibility

The PRCC and KMCC coal lease applications were submitted and will be processed and evaluated under the following authorities:

- the Mineral Leasing Act of 1920 (MLA), as amended;
- the Multiple-Use Sustained Yield Act of 1960;
- the National Environmental Policy Act of 1969 (NEPA);
- the Federal Coal Leasing Amendments Act of 1976 (FCLAA);
- the Federal Land Policy and Management Act of 1976 (FLPMA); and
- the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

The BLM is the lead agency responsible for leasing federal coal lands under the MLA as amended by FCLAA and is also responsible

for preparation of this EIS to evaluate the potential environmental impacts of issuing leases. For the PRCC and KMCC applications, the BLM must decide whether to 1) not offer one or both tracts for sale, 2) modify one or both tract configurations and hold a competitive, sealed-bid lease sale for each tract, 3) hold a competitive sealed-bid lease sale for each tract as applied for, or 4) delay the competitive coal lease sale for one or both tracts. Each of these options must be analyzed for potential environmental impacts.

The USFS is a cooperating agency on this EIS because it manages the federal surface lands in the Thunder Basin National Grassland, and these lease applications include some of those lands. Prior to the BLM making a leasing decision on either tract, the USFS must consent to holding the lease sale.

OSM is also a cooperating agency. After a coal lease is issued, 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.

Pursuant to the cooperative agreement, a federal coal lease holder in Wyoming must submit a permit application package to OSM

and WDEQ/LQD for any proposed coal mining and reclamation operations on federal lands in the state. 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. OSM, BLM, the USFS and other federal agencies review the permit application package to insure it complies with the terms of the coal lease, the MLA, NEPA, and other federal laws and their attendant regulations. If the permit application package does comply, WDEQ issues the applicant a permit to conduct coal mining operations. OSM recommends approval, approval with conditions, or disapproval of the mining plan to the Assistant Secretary of the Interior, Land and Minerals Management. Before the mining plan can be approved, the BLM and the USFS must concur with this recommendation.

If the proposed LBA tracts are leased to existing mines, the lessees would be required to revise their coal mining permits prior to mining the coal, following the processes outlined above. As a part of that process, a new mining and reclamation plan would be developed showing how the lands in the LBA tracts would be mined and reclaimed. Specific impacts which would occur during the mining and reclamation of the LBA tracts would be addressed in the mining and reclamation plans, and specific mitigation measures for anticipated impacts would be described in detail at that time.

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 has authority in those emergency situations where WDEQ or OSM

cannot act before environmental harm and damage occurs.

BLM also has the responsibility 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 be required to mine these LBA tracts.

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 KMCC and PRCC applications, 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 applications follow BLM Manual 3420 (Competitive Coal Leasing, BLM 1989) and the 1991 *Powder River Regional Coal Team Operational Guidelines For Coal Lease-By-Applications* (BLM 1991). The *National Environmental Policy Act Handbook* (BLM 1988) has been followed in developing this EIS.

1.4 Conformance with Existing Land Use Plans

FCLAA requires that lands considered for leasing be included in a comprehensive land use plan and that leasing decisions be compatible with that plan. The resource management plan (RMP) for the BLM Buffalo Resource Area (BLM 1985) governs and addresses the leasing of federal coal in this area. *The Medicine Bow National Forest and Thunder Basin National Grassland Land*

and Resource Management Plan (LRMP) (USFS 1985) governs and addresses the management of USFS (public) lands in the area. All management decisions concerning these respective lands must comply with these plans.

Coal land use planning involves four planning screens to determine whether the subject coal is acceptable for further lease consideration. 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.

Only those federal coal lands that pass these screens are given further consideration for leasing.

For the RMP's, only in-place coal with beds at least 5 ft thick, stripping ratios of 15:1 or less, and less than 500 ft of overburden were addressed and carried forward. The lands in these coal lease applications pass this test and were addressed in the Thunder Basin National Grassland LRMP.

The coal leasing unsuitability criteria listed in the federal coal management regulations (43 CFR 3461) have been applied to high to moderate coal potential lands in the Thunder Basin National Grassland. This analysis is contained in Appendix F of the LRMP Final EIS (USFS 1985). Appendix B of this EIS summarizes the unsuitability criteria, describes the findings for the Thunder Basin National Grassland, and presents a validation of these findings for the KMCC and PRCC applications.

As indicated in Appendix B, the lands in the Thundercloud Tract within the BN/C&NW

right-of-way are unsuitable for mining under Unsuitability Criterion Number 2. These lands are included in the LBA tract to allow recovery of all of the mineable coal outside of the railroad right-of-way and to comply with the coal leasing regulations which do not allow leasing of less than 10-acre aliquot parts. A stipulation stating that the portion of the lease within the BN/C&NW right-of-way cannot be mined will be added to the lease when it is issued. The exclusion of the coal underlying the railroad right-of-way from mining activity by lease stipulation honors the finding of unsuitability for mining under Unsuitability Criterion Number 2 for the BN/C&NW right-of-way.

Surface owner consultation was completed during preparation of the 1985 LRMP, and qualified private surface owners¹ with land over federal coal were provided the opportunity to have their views considered by the USFS during land use planning. The lands in this application were addressed in the LRMP and carried forward as acceptable for further lease consideration based on satisfactory surface owner consultations at that time. Based on updated surface ownership provided by KMCC, the surface on the Thundercloud LBA Tract is owned by the United States of America, KMCC, Atlantic Richfield, and the Gladys K. Norwood estate. The federally owned land is part of the Thunder Basin National Grassland, administered by the USFS. Data provided by PRCC indicate the surface on the Powder River LBA Tract is owned by the United States of America, the State of

Wyoming, PRCC, the Bridle Bit Ranch Company, and the Dilts Brothers. Again, the federally owned land is part of the Thunder Basin National Grassland, administered by the USFS. All federal coal lands in both applications were determined acceptable for further lease consideration, with the consent of the surface owners.

As part of the coal planning for the Thunder Basin National Grassland LRMP and Buffalo Resource Area RMP, a multiple land use conflict analysis was completed to identify and "eliminate additional coal deposits from further consideration for leasing to protect resource values of a locally important or unique nature not included in the unsuitability criteria," in accordance with 43 CFR 3420.1-4e(3). The multiple use conflict evaluation concluded that there were no serious surface resource use conflicts on Thunder Basin National Grassland and that any conflicts which do arise can be mitigated on a case-by-case basis. All of the lands in the application areas were subjected to this multiple use conflict analysis and determined to be acceptable for further lease consideration (USFS 1985).

In summary, all of the lands in the PRCC and KMCC coal lease applications have been subjected to the four coal planning screens and determined acceptable for further lease consideration. Thus, a decision to lease and mine the federal coal lands in these applications would be in conformance with both the BLM Buffalo Resource Area RMP and USFS Thunder Basin National Grassland LRMP.

1.5 Consultation and Coordination

Initial Involvement

The PRCC and KMCC lease applications were initially reviewed by the BLM,

¹ The natural person or persons (or corporation, the majority stock of which is held by a person or persons) who 1) hold legal or equitable title to the land surface, 2) have their principal place of residence on the land or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations, or receive directly a significant portion of their income, if any, from such farming or ranching operations, and 3) have met the conditions of 1 and 2 for a period of at least 3 years prior to granting of any consent to mining of their lands.

Wyoming State Office, Division of Mineral and Lands Authorization. The BLM ruled that the application and lands involved met the requirements of regulations governing coal leasing on application (43 CFR 3425).

The BLM Wyoming State Director notified the Governor of Wyoming on May 5, 1995 that PRCC had filed a lease application with BLM for the Powder River LBA Tract. The Governor of Wyoming was notified on August 23, 1995 that KMCC had filed a lease application with BLM for the Thundercloud LBA Tract.

A notice announcing the receipt of both the PRCC and KMCC coal lease applications was published in the *Federal Register* on March 12, 1996. Copies were sent to voting and nonvoting members of the PRRCT, including the governors of Wyoming and Montana, the Northern Cheyenne Tribe, the Crow Tribal Council, the USFS, OSM, United States Fish and Wildlife Service (USFWS), National Park Service, and USGS.

Both lease applications were reviewed by the PRRCT at their April 23, 1996 public meeting in Cheyenne, Wyoming, at which time PRCC and KMCC presented information about their existing mines and pending lease applications to the PRRCT. The PRRCT recommended that BLM process both coal lease applications as lease-by-applications. The major steps in processing an LBA are shown in Appendix C.

The BLM filed a Notice of Scoping in the *Federal Register* on June 20, 1996. The filing served as notice that the KMCC and PRCC coal lease applications had been received and public comment was requested.

A public scoping meeting was held on June 27, 1996 in Gillette, Wyoming. At the

public meeting, both companies orally presented information about their mines and their need for the coal. These presentations were followed by a question and answer period, during which several oral comments were made. BLM received nine written comments during the scoping period. A Notice of Intent to prepare a joint EIS was published in the *Federal Register* on December 9, 1996. Public comments were again requested in this notice, but no additional comments were received.

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 FEIS (Table 5-3).

Issues and Concerns

Issues and concerns expressed by the public and government agencies relating to the KMCC and PRCC coal lease applications included:

- cumulative impacts on air quality;
- cumulative impacts on wildlife;
- impacts on endangered species;
- impacts on raptors;
- wetland impacts;
- water quality impacts and effects on fisheries, migratory birds, and threatened or endangered species;
- short- and long-term impacts on fish and wildlife;
- impacts to surface- and groundwater quantity and quality;

- acreage disturbed vs. acreage reclaimed;
- impacts on recreational use and wildlife-related recreation;
- impacts on Native American cultural resources;
- impacts on existing oil and gas wells and gas-gathering systems;
- potential overlapping impacts of coal bed methane development and surface coal mining; and
- loss of natural resources.

Draft EIS

Parties on the distribution list were sent copies of the DEIS, and copies were available for review at the BLM offices in Casper and Cheyenne. A notice announcing the availability of the DEIS was published in the *Federal Register* by the Environmental Protection Agency (EPA) on August 22, 1997. The BLM published a Notice of Availability/Notice of Public Hearing in the *Federal Register* on August 29, 1997. The comment period on the DEIS commenced with publication of the Notice of Availability and ended on October 28, 1997. The BLM *Federal Register* notice announced the date and time of the public hearing and solicited public comments on the DEIS and on the fair market value, the maximum economic recovery, and the proposed separate competitive sales of coal from the two LBA tracts. A formal public hearing was held at 7:00 p.m. on October 8, 1997 at the Holiday Inn in Gillette, Wyoming. All comments received on the DEIS are included, with responses, in this FEIS (Appendix H).

Final EIS and Future Involvement

Availability of the FEIS has been published in the *Federal Register* by the BLM and the EPA. After a 30-day availability period, BLM will make separate decisions to hold or not to hold a competitive lease sale and issue a lease for the federal coal for each tract. A separate public Record of Decision (ROD) for each tract will be mailed to parties on the mailing list and others who commented on these LBA's during the NEPA process. The USFS must consent or not consent to the surface use of the USFS lands in each LBA tract for coal mining before BLM can sign either ROD. Both the public and the applicant can protest the USFS decision (to consent or not to consent) and the BLM decision (to hold a competitive sale and issue a lease for each tract).

The USFS decision to consent or not to consent must be appealed within 45 days after it is signed by the Regional Forester and published in the Denver Post. The decision can be implemented 5 days following the appeal period if no appeal is received. If an appeal of the USFS decision is received, 45 days are afforded to resolve the appeal; and 15 days following the resolution, the decision can be implemented.

The BLM decision to hold a competitive sale and issue a lease or not hold a competitive sale and issue a lease must be appealed within 30 days after the BLM decision is signed. The decision can be implemented at that time if no appeal is received. If a competitive lease sale is held, the lease sale will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H-3420-1 (Competitive Coal Leasing).

Attorney General Consultation

After the competitive coal lease sales, but prior to issuance of the leases, the BLM will solicit the opinion of the Attorney General on whether the planned lease issuances create a situation inconsistent with federal anti-trust laws. The Attorney General is allowed 30 days to make this determination. If the Attorney General has not responded in writing within the 30 days, the BLM can proceed with issuance of the leases.

2.0 PROPOSED ACTION AND ALTERNATIVES

This EIS addresses the Proposed Action of holding two separate competitive coal lease sales and issuing maintenance leases to the successful bidders (either the applicants or other qualified bidders) for the Powder River and Thundercloud LBA Tracts as applied for. Additional alternatives considered include:

- Alternative 1: No Action (not leasing either tract);
- Alternative 2: Configuring one or both tracts differently (adding or subtracting coal from one or both of the tracts, based on geologic, engineering, and/or economic considerations), holding two separate competitive coal lease sales, and issuing maintenance leases to the successful bidders (either the applicants or other qualified bidders) for each tract;
- Alternative 3: Holding a competitive coal lease sale and issuing a lease to the successful bidder (not the applicant or an adjacent existing mine) for development of one or both tracts as a new, stand-alone mine; and
- Alternative 4: Delaying the competitive coal lease sale for one or both tracts.

The Powder River and Thundercloud LBA Tract configurations as applied for (Proposed Action), and tract configurations as amended by BLM (Alternative 2), are shown on Figures 2-1 and 2-2, respectively.

Lease-by-application tracts are nominated for leasing by companies with an interest in acquiring them, but as discussed in Chapter

1.0, the LBA process is, by law and regulation, an open, public, competitive sealed-bid process. Thus, if the decisions reached as a result of this EIS are to hold separate lease sales, the applicants (PRCC and KMCC) may not be the high bidders. Nonetheless, the analysis presented in this EIS assumes the applicants would be the successful bidders if a competitive sale is held, and KMCC and PRCC would mine the lands as maintenance tracts with the permitted Jacobs Ranch Mine and North Antelope and Rochelle Mines, respectively.

The Thundercloud LBA Tract is also located adjacent to the Black Thunder Mine, operated by Thunder Basin Coal Company, LLC (TBCC), currently owned by Atlantic Richfield Company (ARCO). TBCC is also in a position to mine the tract as a maintenance lease. If TBCC acquires the tract, the rate of coal production, mining sequence, equipment, and facilities would be different than if KMCC acquired the tract. However, the impacts of TBCC mining the tract would be similar to the impacts of KMCC mining the tract, and company-specific mining and reclamation plans would not significantly alter the disturbed acreage and would not substantially alter the environmental analysis conducted in this EIS.

If a decision is made to hold competitive lease sales and there are successful bidders, mining and reclamation plans must be developed by the successful bidders and approved before mining can begin on the tracts. As part of the approval process, a mining and reclamation plan undergoes detailed review by state and federal agencies. This plan may differ from the plan summarized here, but changes to the mining plan used for this analysis would not be expected to significantly change the impacts described in this EIS. Those changes would typically be related to the details of mining

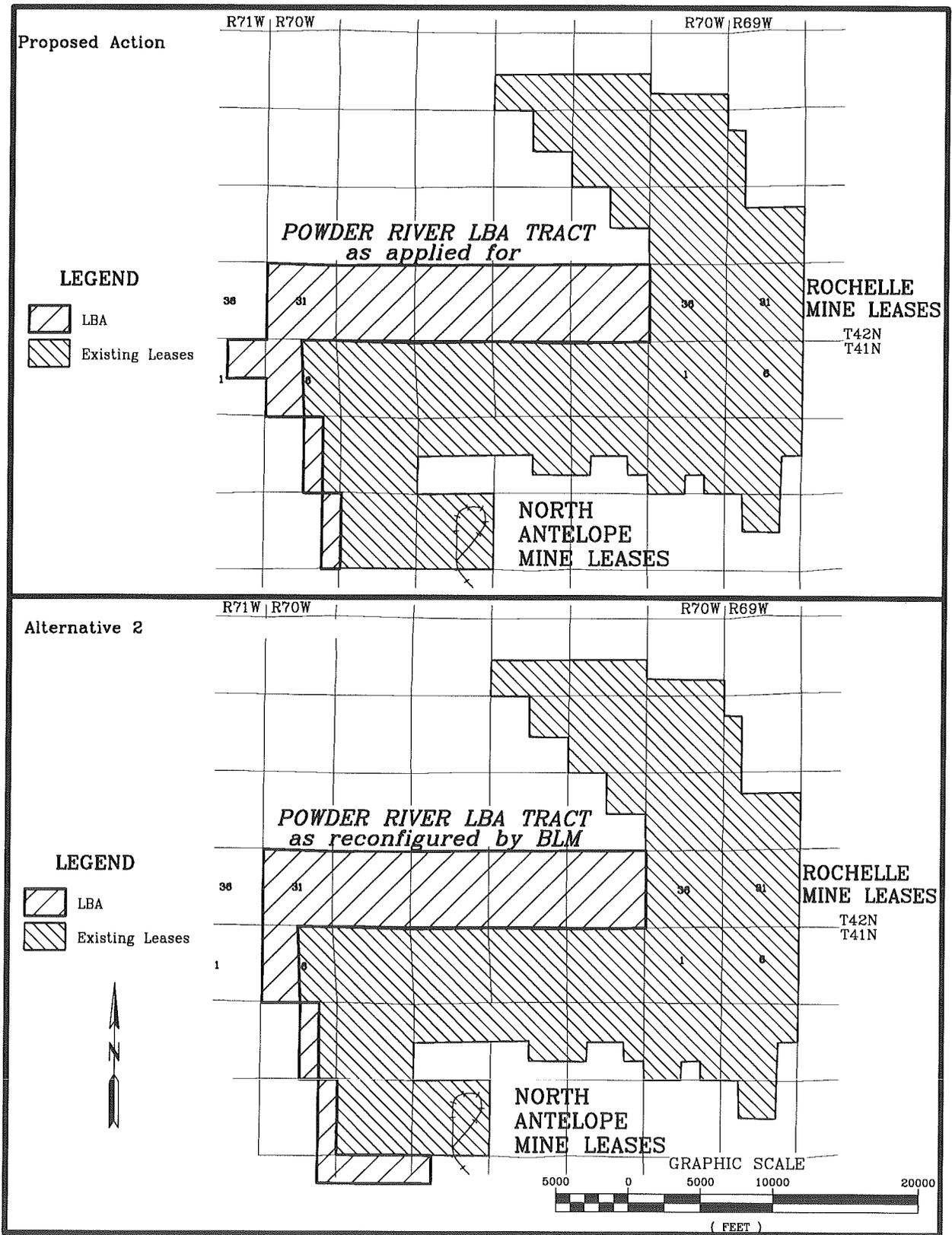


Figure 2-1. Powder River LBA Tract Configurations.

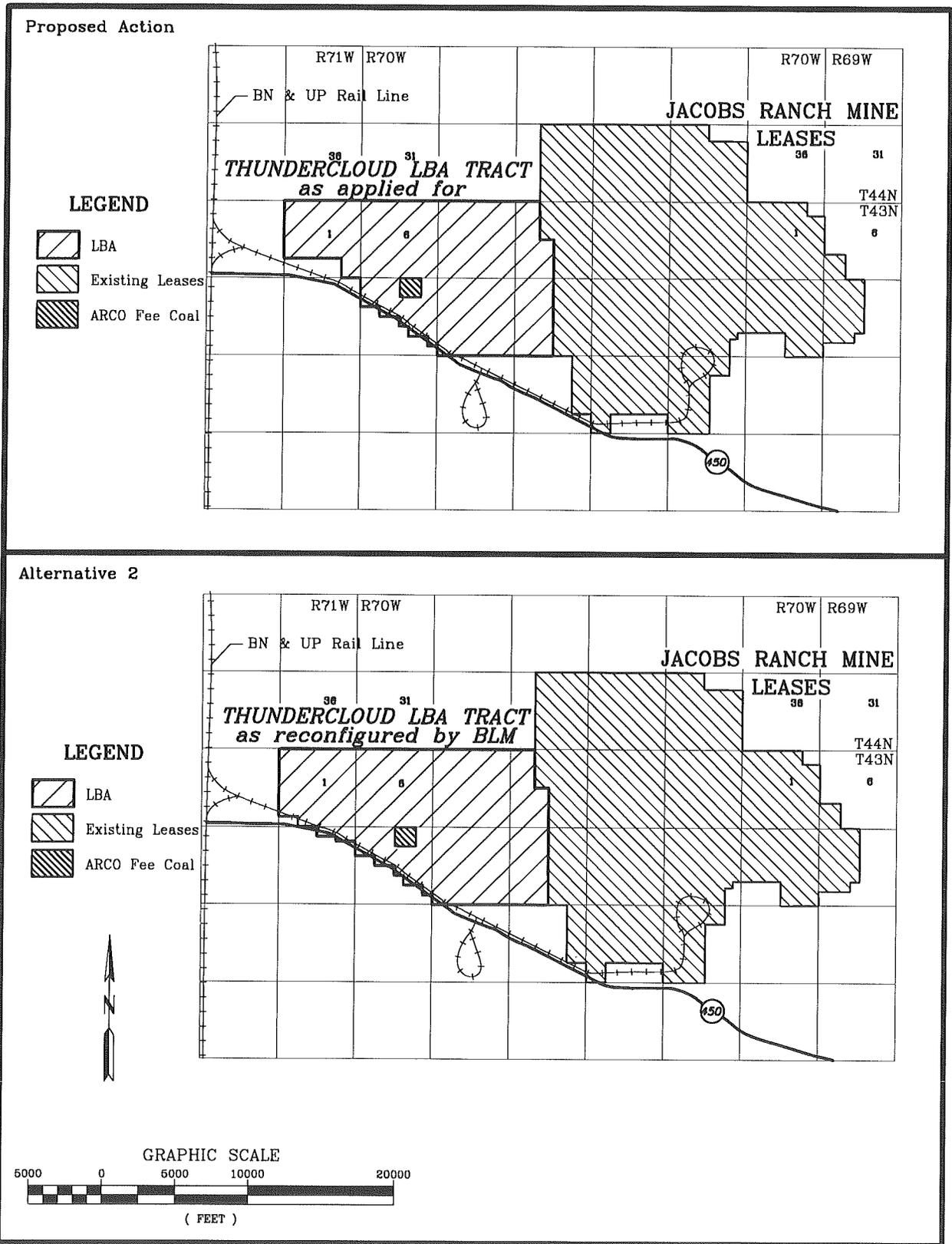


Figure 2-2. Thundercloud LBA Tract Configurations.

2.0 Proposed Action and Alternatives

and reclaiming the tracts, and major issues such as tons of coal mined, acres disturbed, and other environmental impacts would not be significantly different.

2.1 Proposed Action

Under the proposed action, the Powder River LBA Tract and the Thundercloud LBA Tract, as applied for by PRCC and KMCC, respectively, would be offered for lease at separate competitive sales, subject to standard and special lease stipulations developed for the PRB (Appendix D). The boundaries of the tracts would be consistent with the tract configurations proposed in the Powder River and Thundercloud LBA Tract lease applications (see Figures 2-1 and 2-2). The Thundercloud LBA Tract configuration contains 40 acres of privately owned surface and coal owned by ARCO. Although this coal is not federally owned, it would be logically mined with the federal coal in the Thundercloud Tract. Therefore, for the purposes of the environmental analysis in this EIS, it is assumed that this coal will be mined in conjunction with the federal coal in the Thundercloud Tract. The proposed action assumes that PRCC will be the successful bidder on the Powder River Tract, if it is offered for sale, and that KMCC will be the successful bidder on the Thundercloud LBA Tract if it is offered for sale.

Powder River LBA Tract

The legal description of the proposed Powder River LBA Tract coal lease lands as applied for by PRCC under the Proposed Action is as follows:

T41N, R71W, 6th P.M., Campbell County,
Wyoming

Section 1, Lots 5, 6, 11, 12
161.24 acres

T41N, R70W
Section 6, Lots 10-13 and 18-21
308.42 acres
Section 7, Lots 6, 11, 14, 19
160.42 acres
Section 18, Lots 5, 12, 13, 20
158.61 acres

T42N, R70W
Section 31, Lots 5-20 587.53 acres
Section 32, Lots 1-16 657.29 acres
Section 33, Lots 1-16 656.16 acres
Section 34, Lots 1-16 664.43 acres
Section 35, Lots 1-16 669.36 acres

Total surface area applied for:
4,023.46 acres

Land descriptions and acreage are based on the BLM Status of Public Domain Land and Mineral Title, approved Coal Plats as of January 12, 1995 and February 28, 1995.

The tract contains an estimated 515 million tons of coal. This estimate of coal resources is based on information provided by the applicant. BLM will independently evaluate the volume of the coal reserves included in the tract as part of the fair market value determination process. This reserve estimate will be included in the sale notice if the tract is offered for sale.

The Powder River LBA Tract will be mined as an integral part of the North Antelope Mine and the Rochelle Mine under the Proposed Action. The North Antelope Mine and Rochelle Mine are already operating under approved mining permits. The permits will require amendment to include the LBA tract. Since the Powder River LBA Tract would be an extension of the existing North Antelope/Rochelle Mines, the facilities and infrastructure will be the same as those identified in the WDEQ/LQD Mine Permit 532 Term T5 approved February 1, 1996 for

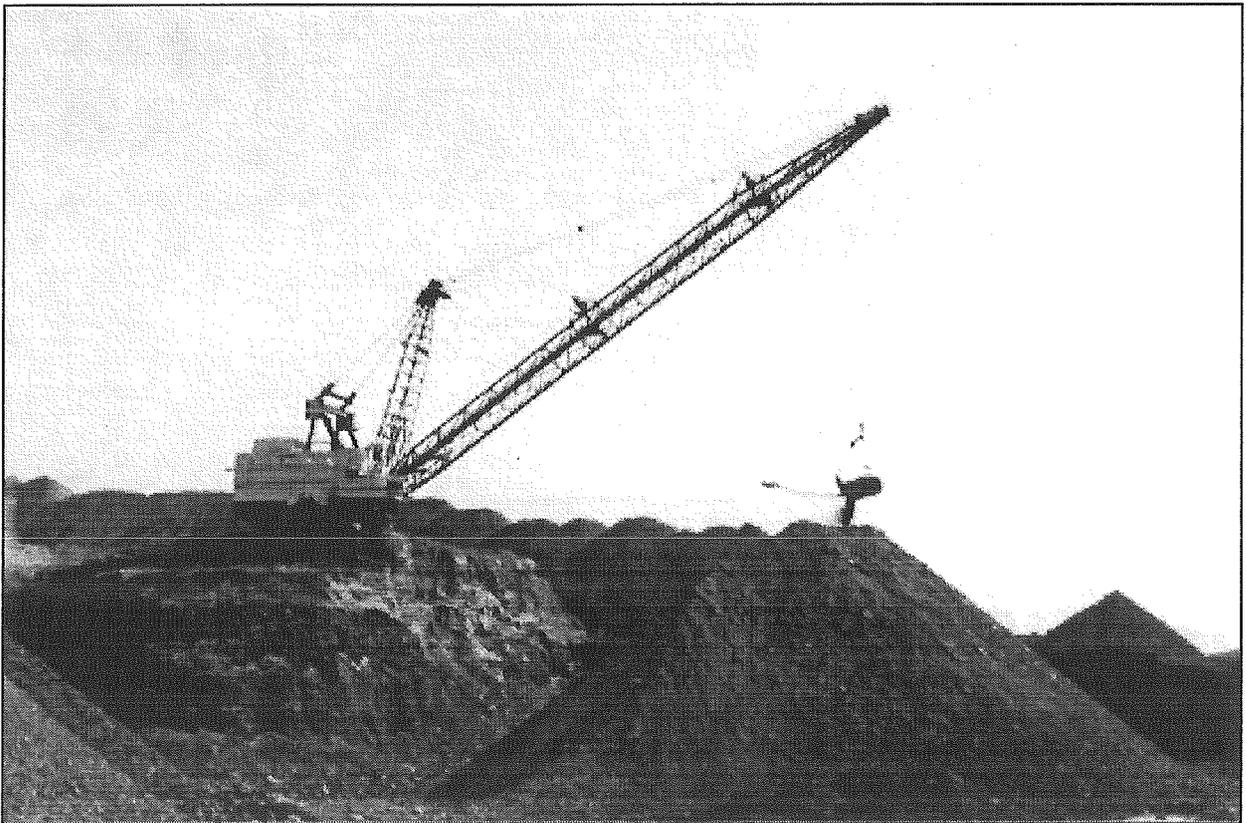
the North Antelope Mine, Permit 569 Term T4 approved August 31, 1994 for the Rochelle Mine; the BLM Resource Recovery and Protection Plans, approved February 1, 1986 and January 9, 1997 for the North Antelope and Rochelle Mines, respectively, and the BLM logical mining unit approved November 25, 1986 for the North Antelope Mine. The Rochelle Mine does not have a logical mining unit.

PRCC has an air quality permit approved by the Air Quality Division of the Wyoming Department of Environmental Quality (WDEQ/AQD) to mine up to 35 million tons of coal per year at the North Antelope Mine and 30 million tons per year at the Rochelle Mine. In 1996, the North Antelope and Rochelle Mines produced 28.6 million tons and 26.2 million tons respectively (Wyoming Coal Information Committee 1997). The Powder River LBA Tract will extend the life

of these existing mines, allowing them to maintain the combined permitted coal production level of 65 million tons per year.

A total of 1,129 million tons would be mined from the proposed combined permit areas after 1997, with an estimated 489 million tons from the Powder River LBA Tract. The 489 million tons of coal is based on a recovery of 95% of the in-place reserve as determined by operational experience to date. A total estimated 3,045 million bank cubic yards of overburden will be excavated. Prior to the end of 1997, 291 million tons of coal and 459 million bank cubic yards of overburden will have already been excavated from within the current permitted area of the two mines.

Topsoil removal with scrapers, using a combination of company-owned and contractor equipment, will proceed ahead of



Typical dragline operation showing overburden removal (left) and backfill placement (right).

2.0 Proposed Action and Alternatives

overburden removal. Whenever possible direct haulage to a reclamation area will be done, but due to scheduling, some topsoil will be temporarily stockpiled. As the reclamation plan requires, scrapers again will be used to haul and distribute the stockpiled topsoil. Mining will be accomplished in three separate pits identified as West Pit, Middle Pit, and East Pit. Trucks and shovels will be used for overburden removal at the West and Middle Pits; a 64-yard dragline will remove overburden at the East Pit. Most overburden and all coal will be drilled and blasted to facilitate efficient excavation. As overburden is removed, most will be directly placed into areas where coal has already been removed. Elevations consistent with an approved post-mining topography (PMT) plan will be established as quickly as possible. Under certain conditions, the PMT may not be immediately achievable. This will occur when there is an excess of material which may require temporary stockpiling; when there is insufficient material available from current overburden removal operations; or when future mining could redisturb an area already mined.

Coal will be loaded with electric shovels (45 cubic yard to 80 cubic yard capacity) and rubber tired loaders into 240-ton off-highway trucks for transport to crushing facilities. Coal haul roads will be temporary structures built within the mining areas. There are three existing crushing facilities within the permit area that together provide capacity to produce at the permitted level. The three facilities all employ one-stage crushing to size coal to a nominal 2-inch product. There is a total of five storage silos, each with a batch-weigh loadout and a covered storage slot. All facilities have either bag houses or stilling sheds to control coal dust emissions. While sufficient capacity exists, future changes in facilities may be constructed to improve operating efficiencies.

Current full-time employment at the two mines is 640. Projected future employment will increase to 860 if the LBA tract is acquired. Existing shop, office and change facilities will be utilized. As employment and equipment increase, minor additions to these facilities may be required.

Thundercloud LBA Tract

The legal description of the proposed Thundercloud LBA Tract coal lease lands as applied for by KMCC under the proposed action is as follows:

T43N, R70W, 6th P.M., Campbell County, Wyoming	
Section 4, Lots 8, 9, 15-18	235.80 acres
Section 5, Lots 5-20	663.71 acres
Section 6, Lots 8-23	645.99 acres
Section 7, Lots 5-7, N1/2 Lot 8, Lots 9-12, N1/2 and SE1/4 Lot 13, and NE1/4 Lot 19	347.50 ¹ acres
Section 8, Lots 1-16	660.84 acres
Section 9, Lots 3-6 and 11-14	325.06 acres
T43N, R71W, 6th P.M., Campbell County, Wyoming	
Section 1, Lots 5-15, 19 and SE1/4 NE1/4	<u>517.01 acres</u>

Total surface area applied for:
3,395.91 acres

¹The NW1/4 NE1/4 Section 7 surface and coal are owned by ARCO and are not included as part of the area or volume of coal being considered for leasing in the Thundercloud LBA Tract.

Land descriptions and acreage are based on the BLM Status of Public Domain Land and Mineral Title, approved Coal Plats as of January 12, 1995 and February 28, 1995.

Approximately 89 acres containing 11 million tons of coal within the Thundercloud LBA Tract are unsuitable for mining due to the presence of the BN/C&NW railroad right-of-way. Although these lands would not be mined, they are included in the tract to allow recovery of all the mineable coal outside of the right-of-way and to comply with the coal leasing regulations which do not allow leasing of less than 10 acre aliquot parts.

The Thundercloud LBA Tract contains approximately 427 million tons of coal, after the area beneath the railroad right-of-way is eliminated. This estimate of coal resources is based on information provided by the applicant. BLM will independently evaluate the volume of the coal reserves included in the tract as part of the fair market value determination process. This reserve estimate will be included in the sale notice if the tract is offered for sale. If KMCC acquires the federal coal lease for these lands, the coal would be mined, processed, and distributed as part of KMCC's permitted Jacobs Ranch Mine, which comprises 9,198 acres and originally contained 538 million tons of coal.

The proposed addition of the Thundercloud LBA Tract reserves would allow KMCC to maintain and expand existing contracts. The additional reserve base will also extend the life of the current mining operations and preserve the long-term job stability of mine employees.

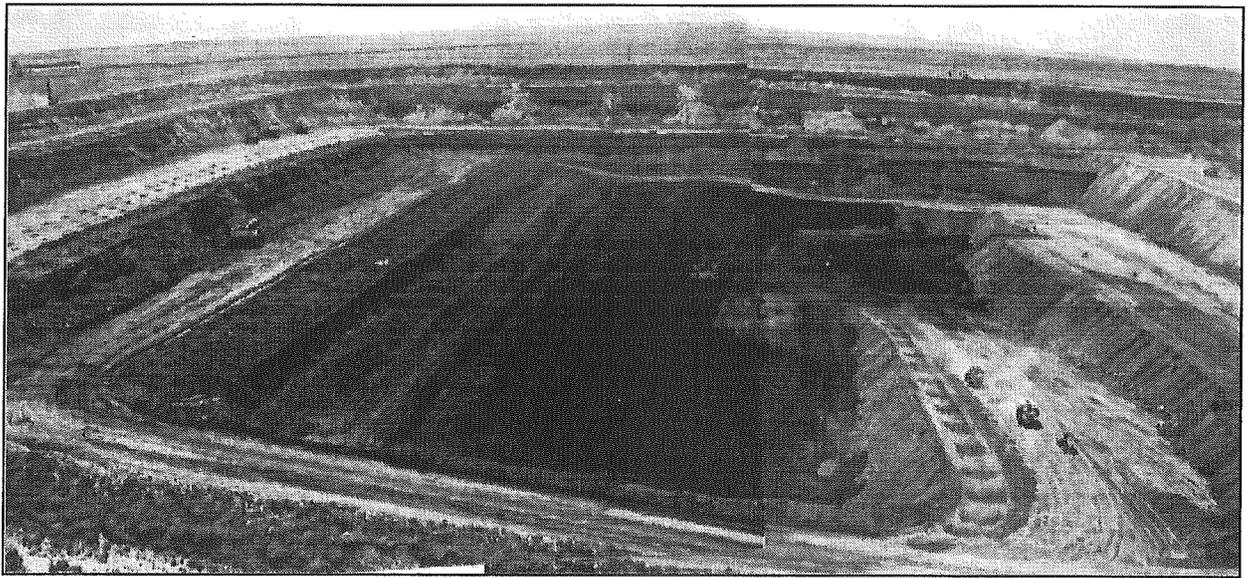
Due to its location and configuration, the Thundercloud LBA Tract is a logical extension of the operations at the Jacobs Ranch Mine and would be mined as an

integral part of the permitted mining operation using the same mining methods. The mining method to be used is a truck and shovel surface mining operation. The mine has an air quality permit approved by WDEQ/AQD to mine up to 35 million tons of coal per year. The mine produced 24.5 million tons in 1996 and plans to increase production to the permitted maximum by 2002. The intended use of the coal is primarily for electrical power generation, the same use as for the coal currently being mined at the Jacobs Ranch Mine.

The Jacobs Ranch Mine is one of several coal mines currently operating in the PRB where the coal seams are notably thick and the overburden is relatively thin. The truck-shovel mining method is the sole means of overburden stripping and coal mining at Jacobs Ranch Mine. Based on experience to date, KMCC projects a 90% recovery factor for the coal in the Thundercloud Tract.

The truck-shovel mining method is used to remove overburden from above the coal seam(s) and place it into the backfill. The overburden is excavated and loaded into trucks by electric power shovels with dipper capacities ranging from 27 to 54 cubic yards. Most of the overburden is drilled and blasted prior to removal. Other equipment used during overburden removal and backfilling includes water trucks, motor graders, track and wheel dozers, scrapers, hydraulic excavators, front-end loaders, and belt loaders.

To maintain a safe bench height in overburden which is up to 180 ft thick, a multiple bench system is used. These benches, which are 20-60 ft high and normally more than 200 ft wide, extend along the advancing face of the operating pit.



Typical truck-shovel operation showing overburden removal (left) and backfill (right).

The floor of each bench is used as a roadway by the haulage equipment, and some of these haulroads extend outside the immediate pit area.

Pits are developed by opening an initial rectangular box cut and hauling the overburden to out-of-pit overburden piles. The volumes of the resulting voids created by overburden and coal removal are sufficient to enable a direct haulback system of the overburden from the advancing face to an in-pit backfill and can be used for virtually the life of the mine. No box cut would be required under the Proposed Action, in which the Thundercloud LBA Tract would be mined as an extension of the Jacobs Ranch Mine.

The exposed coal is drilled and blasted prior to removal. After blasting, the coal is removed by either electrically powered shovels with bucket capacities from 25 to 50 cubic yards or large front-end loaders with bucket capacities up to 27 cubic yards. A belt loader may also be employed for use in mining coal. The 240-ton end-dump haul trucks are used with the shovels while 170-

ton end-dump trucks are used with the other loading equipment or the shovels. The shovels are operated on benches 10-60 ft high by 200 ft wide, similar to the overburden benches.

In cases where the bottom few feet of the seam are extremely wet and soft, due to water in the coal seeping to the bottom of the seam, dozers are used to push the wet coal into piles so that the water can drain. After the coal has dried sufficiently, it is loaded into the haulage trucks and taken to the preparation plant. There are three existing crushing facilities within the permit area that provide the capacity to produce at the permitted level. The three facilities employ one-stage crushing to size coal to a nominal 2-inch product. There are a total of 7 storage silos. While sufficient capacity exists, future facilities may be constructed to improve operating efficiencies. KMCC recently applied to WDEQ/AQD for a modification to the Jacobs Ranch Mine Air Quality Permit to open an additional production facility by the end of 1997 in order to increase its capacity to over 39 million tons per year (Wyoming State Geological Survey, June 1997, p. 27).

Since the Thundercloud LBA Tract would be an extension of the existing Jacobs Ranch Mine operations under the Proposed Action, the facilities and infrastructure will be the same as those identified in the WDEQ/LQD Mine Permit 271 for Term T3 approved August 30, 1994; the BLM R2P2 approved February 1995; and the BLM logical mining unit approved in April 1995. Mining facilities and transportation systems, including maintenance and office buildings, the railroad loop, and the coal crushing, storage, and loading facilities, are located off of coal. Access corridors for roads, utilities, and the railroad are combined as much as possible to restrict surface disturbance and coal losses. Currently there are 375 full-time employees at the Jacobs Ranch Mine. Projected future employment will increase to 420 if the LBA tract is acquired and production is increased to the maximum permitted level.

2.2 Alternative 1

Alternative 1 is the No-Action Alternative. Under the No-Action Alternative, both PRCC's and KMCC's coal lease applications would be rejected, the Powder River and Thundercloud LBA Tracts would not be offered for competitive sale, and the coal contained within the tracts would not be mined. Rejection of the applications would not affect permitted mining activities on existing leases at the Jacobs Ranch, North Antelope, and Rochelle Mines. Approximately 6,955 acres are currently leased at Jacobs Ranch, and about 8,122 acres will eventually be affected. At North Antelope and Rochelle, the total current lease holdings are 11,434 acres and about 11,948 acres will eventually be affected. Portions of the surface of both LBA tracts would probably be disturbed due to overstripping to allow coal to be removed from existing, contiguous leases.

For purposes of this analysis, it is assumed that if the No-Action Alternative is selected neither LBA tract would be mined in the foreseeable future. Selection of this alternative would not preclude leasing of these tracts in the future; however, this assumption allows a comparison of the economic and environmental consequences of mining these lands versus not mining them. If this alternative is chosen, this assumption would become more likely if leasing does not occur in time for these tracts to be mined as extensions of existing operations.

2.3 Alternative 2

Under Alternative 2, the BLM would reconfigure the Powder River and Thundercloud LBA Tracts. Reconfiguration of the tracts 1) makes both tracts more attractive to potential bidders, 2) minimizes the risk of bypassing federal coal that would then become economically unrecoverable, and/or 3) enhances the fair market value of remaining unleased federal coal in the area.

Alternative 2 is the preferred alternative of the BLM.

The BLM determined that the Powder River LBA Tract could be reconfigured to prevent bypass of currently unleased federal coal and enhance the value of remaining unleased federal coal. The original configuration of the Powder River LBA Tract as applied for would be partially reconfigured by removing the following acreage from the tract:

T41N, R71W

Section 1, Lots 5, 6, 11, and 12

Total: 161.24 acres

The Powder River LBA Tract would be further reconfigured by adding the following acreage:

2.0 Proposed Action and Alternatives

T41N, R70W

Section 19, Lot 5, N1/2 Lot 12

Section 20, Lots 1-4 and N1/2 Lots 5-8

Section 21, Lot 4 and N1/2 Lot 5

Total: 362.01 acres

The net increase to the Powder River LBA Tract would be 200.77 acres containing about 19 million tons of coal. The reconfiguration results in a lease comprising 4,224.2 acres containing approximately 532 million tons of coal, or 505 million tons of recoverable coal at 95% according to the information provided by the applicant.

Subsequent to conducting a geologic review of the Thundercloud LBA Tract as applied for, the BLM identified an area northeast of the railroad in T43N, R71W, Sections 1 and 12 that contains approximately 5 million tons of mineable coal that would be bypassed if not added to the Thundercloud LBA Tract. This does not include about 11 million tons of coal within the area added under Alternative 2 that are within the railroad right of way and buffer area that are unsuitable for mining. The reconfiguration results in a lease comprising 3,545.5 acres containing approximately 432 million tons of coal according to the information provided by the applicant. Using KMCC's projected recovery factor of 90%, the reconfigured tract would contain about 389 million tons of recoverable coal. Under Alternative 2, the following area would be added to the Thundercloud LBA Tract as applied for and described in Section 2.1:

T43N, R71W

Section 1, N1/2 Lot 16, Lots 17 and 18

Section 12, Lot 1 and NE1/4 Lot 2

Total: 149.59 acres

Under Alternative 2, the federal coal tracts, with amended boundaries, would be offered for competitive sale subject to the standard coal lease stipulations and to special coal lease stipulations developed for the Wyoming PRB (Appendix D). Alternative 2 also assumes KMCC and PRCC are the successful bidders on the tracts and the coal would be mined as previously described. As with the Proposed Action, if another mine acquires the amended tracts as maintenance tracts, the mining rate and/or sequence may differ from the mining plan used in this analysis. However, the impacts of mining the coal would not be expected to be significantly different.

2.4 Alternatives Considered but Not Analyzed in Detail

2.4.1 Alternative 3

Under Alternative 3, BLM would hold separate competitive coal lease sales and issue separate leases to the successful bidders, one or both of whom is not the applicant and who propose(s) to develop a new stand-alone mine on one or both LBA tracts.

Both the Powder River and Thundercloud LBA tracts potentially contain sufficient coal resources that a new mine could be opened on either tract. If one or both competitive coal sales are held, the successful bidder on either tract could potentially be a party other than the applicant who proposes to start a new coal mine.

A new stand alone mine would require considerable initial capital expenses, including the construction of new surface facilities (i.e., offices, shops, warehouses, coal processing facilities, coal loadout facilities, and rail spur), extensive baseline data collection, and development of a mining

and reclamation plan. A company acquiring this coal would have to compete for customers with established mines in a competitive market that is currently characterized by low prices. At this time it is unlikely that these tracts would attract bidders interested in starting new mines. Therefore, Alternative 3 is not being considered by BLM and is not analyzed in detail in this EIS. The environmental impacts of developing a new mine to recover the coal resources in one or both of the LBA tracts would be greater than under the Proposed Action, the No Action Alternative, or Alternative 2 because of the need for new facilities, a new rail line, new employment, and the creation of additional sources of dust and blasting.

2.4.2 Alternative 4

Under Alternative 4, sale of both the Powder River and Thundercloud LBA tracts would be postponed or the sale of one of the tracts would be postponed until PRB coal prices increase. A price increase could potentially increase the fair market value of the coal resources in the LBA tracts, which could increase the bonus bid when the coal is leased.

The Clean Air Act of 1990 includes provisions that encourage the use of low sulfur coal. As a result, PRB coal production has increased by more than 10% annually since 1992. However, an increase in coal prices has not accompanied this increased demand. With the expiration of older contracts with guaranteed prices, and the market shift to spot sales of coal, the average price paid for coal from northeastern Wyoming has decreased by more than \$1.00 per ton since 1992.

There are two major sources of revenue to state and federal governments from the

leasing and mining of federal coal: 1) a bonus bid paid at the time the coal is leased, and 2) a 12.5% royalty collected when the coal is sold. The royalty payment is the larger of the two income sources. Since the royalty payment is collected when the coal is sold, government revenues increase if prices rise. Although postponement of the lease sale until prices rise could conceivably result in higher bonus payments for the tracts, it would not necessarily result in higher royalty payments. It takes several years to lease and permit a coal tract, and coal prices would not necessarily remain high until the coal is actually mined if a sale is postponed until the price increases. If the coal is already leased when prices increase, the company might be able to negotiate longer term contracts at the higher prices. If leasing is delayed too long, adjacent mining operations may be completed. If that occurs, the LBA tracts may only be mineable as new mines. Because of the high cost of starting a new mine, the value of the tracts as new mines may be less than their value as production maintenance tracts.

This alternative was not analyzed in detail because the potential impacts to economic benefits are not predictable and the environmental impacts of mining coal at a later time would be expected to be similar and about equal to the Proposed Action or Alternative 2.

2.5 Comparison of Alternatives

The locations of the Proposed Action and Alternative 2 for the Powder River and Thundercloud LBA Tracts are shown on Figures 2-1 and 2-2. A summary comparison of coal production, surface disturbance, mine life, and projected federal and state revenues for the Proposed Action and Alternatives 1 and 2 for the Powder River LBA Tract and

the Thundercloud LBA Tract are presented in Tables 2-1 and 2-2, respectively.

Table 2-3 presents a comparative summary of the direct and indirect environmental impacts of implementing each alternative as compared to the No-Action Alternative. The No-Action Alternative assumes completion of currently permitted mining at the Jacobs Ranch Mine for comparison to the Thundercloud LBA Tract and completion of mining at the North Antelope and Rochelle Mines for comparison to the Powder River Tract. Table 2-4 presents a comparative summary of cumulative environmental impacts of implementing each alternative. The environmental consequences of the Proposed Action and both alternatives 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 2-1. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Powder River LBA Tract, North Antelope and Rochelle Mines

Item	No Action Alternative (Existing North Antelope/Rochelle Mines)	Added by Proposed Action	Added by Alternative 2
Leased Coal (In place)	1.01 billion tons ¹	515 million tons	532 million tons
Recoverable Coal ^{2, 3}	971 million tons	489 million tons	505 million tons
Lease Acres ³	11,434 acres	4,023.5 acres	4,224.2 acres
Total Area To Be Disturbed	11,948 acres	4,626 acres	4,669 acres
Permit Area ⁴	16,217 acres	6,530 acres	6,530 acres
Average Annual Coal Production	65 million tons	none added (65 million tons)	none added (65 million tons)
Life Of Mine	33 years	7.5 years	7.8 years
Average No. Of Employees	640	220	220
Total Projected State Revenues ⁵	\$1.07 billion	\$538 million	\$555 million
Total Projected Federal Revenues ⁶	\$334 million	\$168 million	\$174 million

¹ Does not include 165 million tons of coal in original lease that were never included in the mine permit due to economic factors.

² Assumes 95% recovery of in-place coal reserves, based on operational experience at the North Antelope and Rochelle Mines.

³ Tons and acres provided for life of mine beginning in 1983 for North Antelope Mine and 1985 for Rochelle Mine.

⁴ Includes combined North Antelope and Rochelle Mine Permit Areas, which overlap. Separately, the two permit areas comprise 18,063 acres.

⁵ Projected revenue to the State of Wyoming assumes the State will receive \$1.10 per ton of coal sold (University of Wyoming 1994). Projection includes estimated income to the State from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments.

⁶ Federal Revenues based on a \$4.00/ton price x federal royalty of 12.5% x amount of recoverable coal plus bonus payment of 17.8¢/ton based on an average of last 7 LBA's (see Table 1-1) x amount of leased coal less state's 50% share.

Table 2-2. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Thundercloud LBA Tract and Jacobs Ranch Mine

Item	No Action Alternative (Existing Jacobs Ranch Mine)	Added by Proposed Action	Added by Alternative 2
Leased Coal (in place)	538 million tons	427 million tons ¹	432 million tons ²
Recoverable Coal ³	484 million tons	384 million tons	389 million tons
Lease Acres	6,955 acres	3,395.9 acres ⁴	3,545.5 acres ⁴
Total Area To Be Disturbed	8,122 acres	3,749 acres ⁵	3,834 acres ⁵
Permit Area	9,198 acres	3,851 acres ⁵	3,851 acres ⁵
Average Annual Coal Production (1997 forward)	27 million tons	8 million tons (to 35 million tons)	8 million tons (to 35 million tons)
Life Of Mine	30 years	11 years	11.1 years
Average No. Of Employees	350	100	100
Total Projected State Revenues ⁶	\$532 million	\$422 million	\$428 million
Total Projected Federal Revenues ⁷	\$169 million	\$134 million	\$136 million

¹ Excludes the 40-acre coal tract in the NW/4 NE/4 of Section 7 owned by ARCO. Includes 11 million tons beneath the railroad right of way and buffer area.

² Excludes the 40-acre coal tract in the NW/4 NE/4 of Section 7 owned by ARCO. Includes 20 million tons beneath the railroad right of way and buffer area.

³ Assumes 90% recovery of in-place coal reserves.

⁴ Excludes the 40-acre coal tract in the NW/4 NE/4 of Section owned by ARCO.

⁵ Includes the 40-acre coal tract in the NW/4 NE/4 of Section 7 owned by ARCO.

⁶ Projected revenue to the State of Wyoming assumes the state will receive \$1.10 per ton of coal sold (University of Wyoming 1994). Projection includes estimated income to the State from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments.

⁷ Federal revenues based on a \$4.00/ton price x federal royalty of 12.5% x amount of recoverable coal plus bonus payment of 17.8¢/ton based on an average of last 7 LBA's (see Table 1-1) x amount of leased coal less state's 50% share.

Table 2-3. Summary Comparison of Magnitude¹ and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, and the No-Action Alternative for the Powder River and Thundercloud LBA Tracts²

¹ Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.
² All impacts are assumed to be adverse unless noted otherwise.

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	
RESOURCE NAME	NO ACTION ALTERNATIVE	PROPOSED ACTION & ALTERNATIVE 2
TOPOGRAPHY & PHYSIOGRAPHY PERMANENT TOPOGRAPHIC MODERATION could result in: Microhabitat reduction Habitat diversity reduction Reduction in water runoff and peak flows Increased precipitation infiltration Wildlife carrying capacity reduction Reduction in erosion Enhanced vegetative productivity Potential acceleration of groundwater recharge	Moderate, long term on existing mine areas Moderate, possibly short term on existing mine areas Moderate, long term on existing mine areas Moderate, beneficial, long term on existing mine areas Moderate, long term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas
GEOLOGY AND MINERALS SUBSURFACE changes would result in: Removal of coal Removal and replacement of topsoil and overburden Physical characteristic alterations in geology Loss of coal bed methane	Moderate, short term on existing mine areas Moderate, long term on existing mine areas Moderate, long term on existing mine areas Moderate, permanent on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas
SOILS CHANGES IN PHYSICAL PROPERTIES would include: Increased near-surface bulk density More uniformity in soil type, thickness, and texture Increased uniformity in mixed soils (e.g., texture) Decreased soil loss due to topographic modification	Moderate, long term on existing mine areas Moderate, beneficial, long term on existing mine areas Moderate, beneficial, long term on existing mine areas Moderate, beneficial, long term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas
CHANGES IN CHEMICAL PROPERTIES would include: Uniform soil nutrient distribution	Moderate, beneficial, long term on existing mine areas	Same as No Action on expanded mine areas
CHANGES IN BIOLOGICAL PROPERTIES would include: Organic matter reduction Microorganism population reduction Existing plant habitat reduction in soils stockpiled before placement	Moderate, long term on existing mine areas Moderate, long term on existing mine areas Moderate, long term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas
AIR QUALITY IMPACTS ASSOCIATED WITH MINING OPERATIONS would include: Elevated concentration levels of TSP Elevated concentrations of gaseous emissions	Negligible, short term on existing mine areas Negligible, short term on existing mine areas	Same as No Action on expanded mine areas Moderate short term on expanded mine areas

Table 2-3. (cont'd)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	RESOURCE NAME	NO ACTION ALTERNATIVE	PROPOSED ACTION & ALTERNATIVE 2
<p>WATER RESOURCES SURFACE WATER CHANGES IN RUNOFF CHARACTERISTICS AND SEDIMENT DISCHARGE include the following: Disruption of surface drainage systems Increased runoff and erosion rates Increased infiltration Reduction in peak flows</p>	<p>Moderate, short term on existing mine areas Moderate, short term on existing mine areas Moderate, long term on existing mine areas Moderate, long term on existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>		
<p>GROUNDWATER GROUNDWATER RESOURCE IMPACT would include the following: Removal of coal and overburden aquifers Replacement of existing coal and overburden with spoil aquifers Depressed water levels in aquifers adjacent to mines Change in hydraulic properties Change in groundwater quality in backfilled areas</p>	<p>Negligible, short term on existing mine areas Negligible, long term on existing mine areas Moderate, short term on existing mine areas Negligible, long term on existing mine areas Moderate, long term on existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>		
<p>ALLUVIAL VALLEY FLOORS While a final determination has not been made by WDEQ/LQD, it is believed that there are no AVF's significant to agriculture on the proposed lease tracts</p>	<p>No impact on existing mine areas</p>	<p>No impact within the expanded mine areas</p>		
<p>WETLANDS Removal of all existing wetlands</p>	<p>Wetlands on existing mine areas would be mined and reclaimed</p>	<p>Same as No Action on expanded mine areas</p>		
<p>VEGETATION PROGRESSIVE REDUCTION IN NATIVE VEGETATION would result in: Increased erosion Wildlife and livestock habitat loss Wildlife habitat carrying capacity loss</p>	<p>Moderate, short term on existing mine areas Moderate, short term on existing mine areas Moderate, long term on existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>		
<p>AFTER RECLAMATION the following could result: Changes in surface water networks Reduction in vegetation diversity Reduction in shrub density</p>	<p>Negligible, long term on existing mine areas Negligible, long term on existing mine areas Negligible, long term on existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>		

Table 2-3. (cont'd)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT
RESOURCE NAME	PROPOSED ACTION & ALTERNATIVE 2
NO ACTION ALTERNATIVE	
WILDLIFE	
DURING MINING the following could occur:	Same as No Action on expanded mine areas
Wildlife displacement	Same as No Action on expanded mine areas
Pronghorn passage reduction	Same as No Action on expanded mine areas
Increased mortality rate to small mammals	Same as No Action on expanded mine areas
Temporary displacement of small mammals	Same as No Action on expanded mine areas
Sage grouse habitat removal	Same as No Action on expanded mine areas
Abandonment of raptor nests	Same as No Action on expanded mine areas
Foraging habitat reduction for raptors	Same as No Action on expanded mine areas
Loss of nesting and foraging habitat for MBHFI	Same as No Action on expanded mine areas
Reduction in waterfowl resting and feeding habitat	Same as No Action on expanded mine areas
Loss of songbird foraging habitat	Same as No Action on expanded mine areas
Temporary wildlife habitat loss	Same as No Action on expanded mine areas
Continued road kills by mine-related traffic	Same as No Action on expanded mine areas
THREATENED, ENDANGERED AND CANDIDATE SPECIES	
MINING IMPACTS could result in the following:	Same as No Action on expanded mine areas
Loss of black-footed ferret colonies	Same as No Action on expanded mine areas
Loss of bald eagle nesting and foraging habitat	Same as No Action on expanded mine areas
Loss of peregrine falcon nesting and foraging habitat	Same as No Action on expanded mine areas
Loss of Ute ladies' tresses orchid habitat	Same as No Action on expanded mine areas
Loss of mountain plover habitat	Same as No Action on expanded mine areas
Loss of swift fox habitat	Same as No Action on expanded mine areas
LAND USE AND RECREATION	
ENVIRONMENTAL CONSEQUENCES ON LAND USE would be:	Same as No Action on expanded mine areas
Reduction of livestock grazing	Same as No Action on expanded mine areas
Loss of wildlife habitat	Same as No Action on expanded mine areas
Curtailment of oil and gas development	Same as No Action on expanded mine areas
Loss of public land available for recreation activities	Same as No Action on expanded mine areas
Loss of coal bed methane reserves	Same as No Action on expanded mine areas
CULTURAL RESOURCES	
78 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
1 not eligible for NRHP/recommended for avoidance	Negligible on expanded mine areas
2 unevaluated	Negligible on expanded mine areas
6 eligible for NRHP/4 mitigated, 2 pending mitigation	Same as No Action on expanded mine areas
Possible increase in vandalism	Same as No Action on expanded mine areas
Possible increase in unauthorized collecting	Same as No Action on expanded mine areas
NATIVE AMERICAN CONCERNS	Same as No Action on expanded mine areas

Table 2-3. (cont'd)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	
RESOURCE NAME	NO ACTION ALTERNATIVE	PROPOSED ACTION & ALTERNATIVE 2
PALEONTOLOGICAL RESOURCES Overburden removal could expose fossils for scientific examination	No impact identified on existing mine areas	Same as No Action on expanded mine areas
VISUAL RESOURCES		
EVIDENT IMPACTS DURING MINING include the following: Alteration of landscape classified by the USFS as "common"	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
IMPACTS FOLLOWING RECLAMATION could be: Smoother sloped terrain Reduction in sagebrush density	Negligible, long term on existing mine areas Negligible, short term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas
NOISE		
INCREASED NOISE LEVELS could effect: Nearby occupied dwellings Wildlife in immediate vicinity	Negligible, short term on existing mine areas Negligible, short term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas
TRANSPORTATION FACILITIES		
Increase in duration that coal is shipped on railroads and employees travel on highways by 8-9 years Relocation of pipelines Relocation of utility lines	No impact on existing mine areas No impact on existing mine areas No impact on existing mine areas	Negligible, short term on expanded mine areas Negligible, short term on expanded mine areas Same as No Action on expanded mine areas
SOCIOECONOMICS		
INCREASE IN SOCIOECONOMICS could increase the following: Employment (Increase of up to 320 jobs in expanded mine areas is expected) Revenues from royalties and taxes to the state government Revenues from royalties and taxes to the federal government Economic development Population in Campbell and Converse counties	No impact on existing mine areas No impact on existing mine areas	Moderate, beneficial, short term on expanded mine areas Moderate, beneficial, short term on expanded mine areas Moderate, beneficial, short term on expanded mine areas Moderate, beneficial, long term on expanded mine areas Moderate, beneficial, short term on expanded mine areas

Table 2-4. Summary Comparison of Magnitude and Duration of Cumulative Impacts¹

¹ Refer to Section 4.5 for a discussion of cumulative impacts.

<i>DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE</i>	<i>MAGNITUDE TYPE AND DURATION OF IMPACT</i>	<i>PROPOSED ACTION & ALTERNATIVE 2</i>
<i>RESOURCE NAME</i>	<i>NO ACTION ALTERNATIVE</i>	
TOPOGRAPHY & PHYSIOGRAPHY REDUCED RELIEF AND SUBDUED TOPOGRAPHY could result in: Reduction in topographic diversity Increased precipitation infiltration Biodiversity reduction Big game carrying capacity reduction	Negligible, long term on existing mine areas Negligible, long term on existing mine areas Negligible, long term on existing mine areas Negligible, long term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas
GEOLOGY AND MINERALS RECOVERY OF COAL would result in: Stabilization of municipal, county and state economies	Significant, beneficial, short term on existing mine areas	Same as No Action on expanded mine areas
SOILS RECLAIMED SOILS could result in: Increased soil productivity Reduced erosion	Negligible, long term on existing mine areas Negligible, long term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas
AIR QUALITY IMPACTS ASSOCIATED WITH MINING OPERATIONS would include: Elevated concentration levels of TSP Elevated concentrations of gaseous emissions	Negligible, short term on existing mine areas Negligible, short term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas
WATER RESOURCES SURFACE WATER IMPACTS TO SURFACE WATER could result in: Temporary reduction in soil infiltration rates and increased runoff	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
GROUNDWATER IMPACTS ON GROUNDWATER could result in: Replacing coal and overburden aquifers with spoil aquifers Drawdown in the coal and shallower aquifers in surrounding areas Water-level decline in the sub-coal Fort Union Formation Change in groundwater quality as a result of mining	Negligible, long term on existing mine areas Negligible, short term on existing mine areas Negligible to moderate, short term on existing mine areas Negligible, long term on existing mine areas	Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas
ALLUVIAL VALLEY FLOORS	No cumulative impacts anticipated on existing mine areas	No cumulative impacts anticipated on expanded mine areas
WETLANDS Removal of existing wetlands	Wetlands on existing mine areas would be mined and reclaimed	Same as No Action on expanded mine areas
VEGETATION SURFACE DISTURBANCE would result in: Loss of common native vegetation types for wildlife Regional loss of vegetative diversity	Negligible, short term on existing mine areas Negligible, long term on existing mine areas	Negligible, short term on expanded mine areas Negligible, long term on expanded mine areas

Table 2-4. (cont'd)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE TYPE AND DURATION OF IMPACT	PROPOSED ACTION & ALTERNATIVE 2
RESOURCE NAME	NO ACTION ALTERNATIVE	
<p>WILDLIFE IMPACTS ON WILDLIFE FROM SURFACE MINING could result in: Loss of pronghorn habitat Mule deer and white tail deer population reduction Reduction in raptor nesting sites and foraging habitat Reduction in sage grouse leks Loss of nesting and foraging habitat for MBHFI Reduction in waterfowl habitat Permanent reduction in wildlife habitat diversity Permanent reduction in some wildlife carrying capacity</p>	<p>Moderate, short term on existing mine areas Negligible, short term on existing mine areas Minor, short term on existing mine areas Major, long term on existing mine areas Major, long term on existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>
<p>THREATENED, ENDANGERED AND CANDIDATE SPECIES No significant cumulative impacts to T & E species are projected</p>	<p>Negligible, short term on existing mine areas</p>	<p>Same as No Action on expanded mine areas</p>
<p>LAND USE AND RECREATION IMPACTS ON LAND USE could result in: Loss of agricultural production Disruption of oil and gas development/production Reduction of wildlife habitat</p>	<p>Moderate, short term on existing mine areas Moderate to significant, short term on existing mine areas Moderate, short term on existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>
<p>IMPACTS ON RECREATION could result in: Loss of access to public lands used by recreationists, particularly hunting</p>	<p>Moderate, short term on existing mine areas</p>	<p>Same as No Action on expanded mine areas</p>
<p>CULTURAL RESOURCES</p>	<p>Sites eligible for NRHP would be mitigated on existing mine areas</p>	<p>Same as No Action on expanded mine areas</p>
<p>NATIVE AMERICAN CONCERNS</p>	<p>No impact identified on existing mine areas</p>	<p>Same as No Action on expanded mine areas</p>
<p>PALEONTOLOGICAL RESOURCES</p>	<p>No impact identified on existing mine areas</p>	<p>Same as No Action on expanded mine areas</p>
<p>VISUAL RESOURCES Impacts on visual resources by mining activities</p>	<p>Moderate, short term on existing mine areas</p>	<p>Same as No Action on expanded mine areas</p>
<p>NOISE</p>	<p>No impact anticipated outside of existing mine areas</p>	<p>Same as No Action outside expanded mine areas</p>
<p>TRANSPORTATION FACILITIES Continued use of existing transportation facilities</p>	<p>No additional transportation impacts anticipated</p>	<p>Negligible, short term on expanded mine areas</p>
<p>SOCIOECONOMICS IMPACTS ON SOCIOECONOMICS could include: Mineral and energy related development Employment Housing market Economic development Revenues and royalties</p>	<p>Moderate, beneficial, short term on existing mine areas Significant, beneficial, short term on existing mine areas Significant, short term due to existing mines Significant, beneficial, short term due to existing mine areas Significant, beneficial, short term due to existing mine areas</p>	<p>Same as No Action on expanded mine areas Same as No Action on expanded mine areas</p>

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources in the study area. The resources that are addressed here were identified during the scoping process or interdisciplinary team review as having the potential to be affected. Figure 3-1 shows the general analysis area for most environmental resources.

Critical elements of the human environment (BLM 1988) that could potentially be affected by the proposed actions include air quality, cultural resources, Native American religious concerns, threatened or endangered (T&E) species, hazardous or solid wastes, water quality, and wetlands/riparian zones. USFS Region 2 Sensitive Species could also be affected by the proposed projects. Five other critical elements (areas of critical environmental concern, prime and unique farmland, floodplains, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements that are potentially present in the project area, this EIS discusses the status and potential effects of the project on topography and physiography, geology and mineral resources, soils, water quantity, alluvial valley floors, wetlands, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

3.1 General Setting

The project area is located in the PRB, a part of the Northern Great Plains, which includes most of northeastern Wyoming. Vegetation is primarily sagebrush and mixed grass prairie. The climate is semi-arid, with an average annual precipitation at Wright (see

Figure 3-1) of just over 11 inches (Martner 1986). June (2.35 inches) and May (2.04 inches) are the wettest months, and February (0.29 inch) is the driest. Snowfall averages 25.1 inches, with most occurring in March (5.0 inches) and December (4.5 inches). Potential evapotranspiration, at approximately 31 inches (National Oceanic and Atmospheric Administration 1969), exceeds annual precipitation. The average daily mean temperature is 44.2°F. The highest recorded temperature was 103°F and the lowest was -34°F. July is the warmest month, with a mean daily temperature of 70°F, and January is the coldest (20.5°F). The frost-free period is 100-125 days.

The average annual wind speed at the Black Thunder Mine, which is located between the two LBA areas (see Figure 3-1) is 11.6 miles per hour (mph), with winter gusts often reaching 30-40 mph. Wind speeds are highest in the winter and spring and are predominantly from the southwest and northwest. During periods of strong wind, large quantities of surficial sediments may be entrained and transported notable distances by saltation or in suspension, impacting air quality across the region. The absence of locally elevated terrain limits the formation and duration of temperature inversions, resulting in an average of 15 air-stagnation events annually in the PRB with an average duration of two days each (BLM 1974). General information describing the area's resources were gathered from draft BLM Buffalo Resource Area planning documents (BLM 1996a, 1996b, 1996c, 1996d, 1996g) and a BLM coal leasing study (BLM 1996e).

3.2 Topography and Physiography

The PRB is an elongated, asymmetrical structural downfold. The landscape consists of broad plains, low hills, and tablelands.

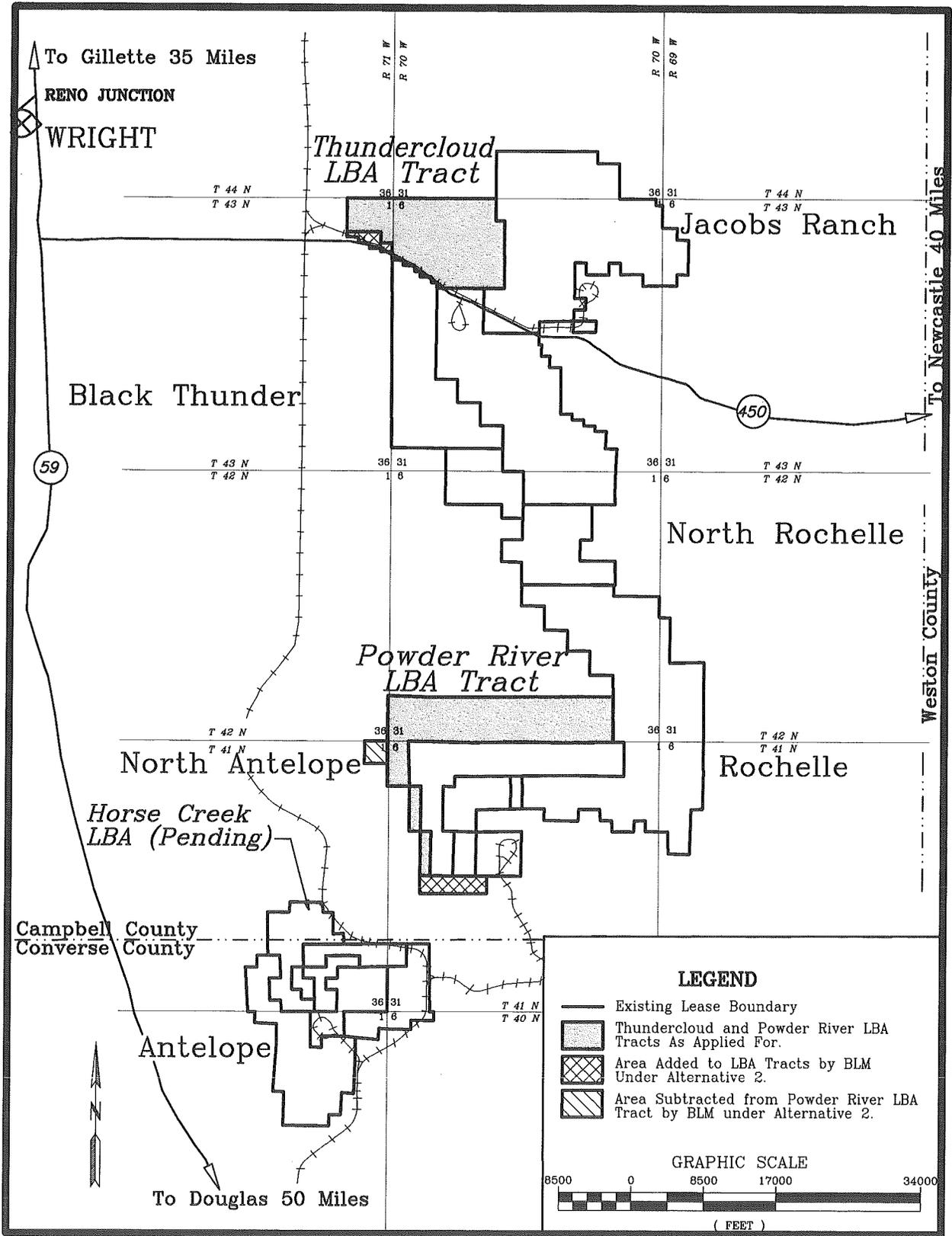


Figure 3-1. General Analysis Area

The steep western limb and the gentle eastern limb of the PRB dip approximately 550 ft/mile and 150 ft/mile, respectively, towards the PRB axis that lies near the western margin. The area is characterized by broad plateaus dissected by incised stream valleys, which create much of the topographic relief. Many of the surfaces exhibit land features strongly influenced by recent wind activity. Strong winds are responsible for differential erosion of the soft surficial sediments by deflation processes. Sediment transport by wind results in removal of large quantities of sediment from some areas. The accumulation of extensive deposits of these fine sediments downwind results where wind velocities are effectively reduced by natural topographic features that influence settling of suspended loads. 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--shallow, closed (internally drained) ponds that receive water during wet seasons--are common. Buttes and plateaus capped by clinker or sandstone are also prevalent.

The PRB 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 to the east. The LBA tracts are located in the south-central part of the PRB at an elevation of about 4,700 ft in an area of low rolling topography.

3.3 Geology

The applicants' main mining objective is the Wyodak coal seam. Confusion has resulted from the use of several names for the unit, including Wyodak, Wyodak-Anderson, Anderson-Wyodak, Anderson-Canyon, Roland-Smith, and others. According to Denson and Pierson (1991), the Anderson and

Wyodak form a single, laterally continuous coal unit, which Glass and Jones (1992) refer to as the Wyodak bed in the Gillette area. The Wyodak bed splits to form the Anderson and Canyon beds (Denson and others 1978). Where the Anderson and Canyon beds diverge and the non-coal rock thickness between them exceeds the thickness of either coal, they are referred to separately as the Anderson or Canyon. In the vicinity of the two LBA tracts, partings are present, but they do not exceed the thickness of the two beds they separate.

At the Thundercloud LBA Tract there are up to three mineable coal seams. These seams are referred to by KMCC personnel as the upper, middle and lower Wyodak. At the Powder River LBA Tract there is one mineable seam, referred to as the Wyodak-Anderson by PRCC personnel. The discussions in this EIS refer to the collective coal seams as the Wyodak coal unless noted otherwise.

The rocks above the recoverable coal (overburden) are interbedded sandstones, siltstones, and shales of the Paleocene Fort Union and Eocene Wasatch formations. For simplicity, mine personnel generally consider the top of the thick, mineable coal zone as the contact between the Fort Union Formation and the overlying Wasatch Formation. At the Wyodak Mine near Gillette, the contact between the Wasatch and Fort Union formations occurs at the top of the mineable coal (Glass 1976). The contact between the Fort Union and Wasatch formations in the Thundercloud LBA Tract and Powder River LBA Tract areas as mapped by Denson and others (1978) occurs several feet above the mineable coal zone.

The main coal seam on the LBA tracts is approximately 75 ft thick. At the Thundercloud LBA Tract, where all three beds merge, the combined thickness may

exceed 100 ft. The overburden ranges from about 150 ft thick at the eastern boundaries of the LBA tracts to over 250 ft on the northern and western boundaries. Figures 3-2 and 3-3 show geologic cross sections drawn through the Thundercloud and Powder River LBA Tracts, respectively. These sections are representative of the geology in the vicinity of the two LBA tracts, the primary variables being the amount of sandstone in the overburden, the local presence of overlying coal seams (rider seams, which are not mineable) or splits in the main Wyodak seam with varying thicknesses of non-coal material (parting) between the seams, and the surface topography. In general, due to gentle westward dip of the PRB in this area, overburden thickness increases toward the west. Erosion has lowered the topography, and therefore reduced overburden thickness, in the stream valleys.

Surficial deposits in the analysis area include Quaternary alluvial and eolian deposits, scoria or clinker, and weathered Wasatch and Fort Union formations. Figure 3-4 shows the stratigraphic relationships of the surface and subsurface geology on and within the two LBA tracts. Scoria forms when near-surface coal beds spontaneously burn and bake the overlying rocks. Scoria is characteristically red in color and in some cases is similar to angular porous gravel; it is generally more resistant to erosion than the enclosing sediments and often forms buttes and plateaus east of the LBA tracts in an area regionally known as the Rochelle Hills. Scoria deposits generally are situated along the coal outcrop, which is where the coal is exposed at the surface. The Wyodak coal is below the surface on both LBA tracts; therefore, scoria is not present on either tract. Surface deposits on the LBA tracts consist of minor alluvial deposits along creeks (North Prong Little Thunder Creek and Mills and Shipley Draws in the

Thundercloud LBA Tract and Porcupine Creek in the Powder River LBA Tract) within the Wasatch Formation. The alluvial deposits consist primarily of poorly to well-sorted, irregularly bedded to laminated, and unconsolidated sand, silt, and clay with minor interbeds of fine gravel. Wind-blown sediments form a thin veneer at the surface along the eastern edge of the Thundercloud LBA Tract and over much of the Powder River LBA Tract.

Drilling and sampling programs have been conducted within specific mines to identify overburden which may be unsuitable for reclamation (i.e., poor for use in re-establishing vegetation). All of the mines have identified some materials which may be unsuitable for reclamation purposes and must be appropriately placed in mine backfill to optimize re-vegetation. Backfill monitoring plans are in place at both Jacobs Ranch Mine and North Antelope and Rochelle Mines to evaluate the quality of replaced overburden. Management plans ensure that materials potentially unsuitable due to adverse levels of pH, selenium or other constituents are not placed in areas where they may affect groundwater quality or revegetation success.

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 1996g).

Coal. There are 17 active coal mines lying along a north/south line that parallels Highway 59 starting just north of Gillette, Wyoming, and extending south for about 75 miles (see Figure 1-1). The mines have been located where the coal is at its shallowest

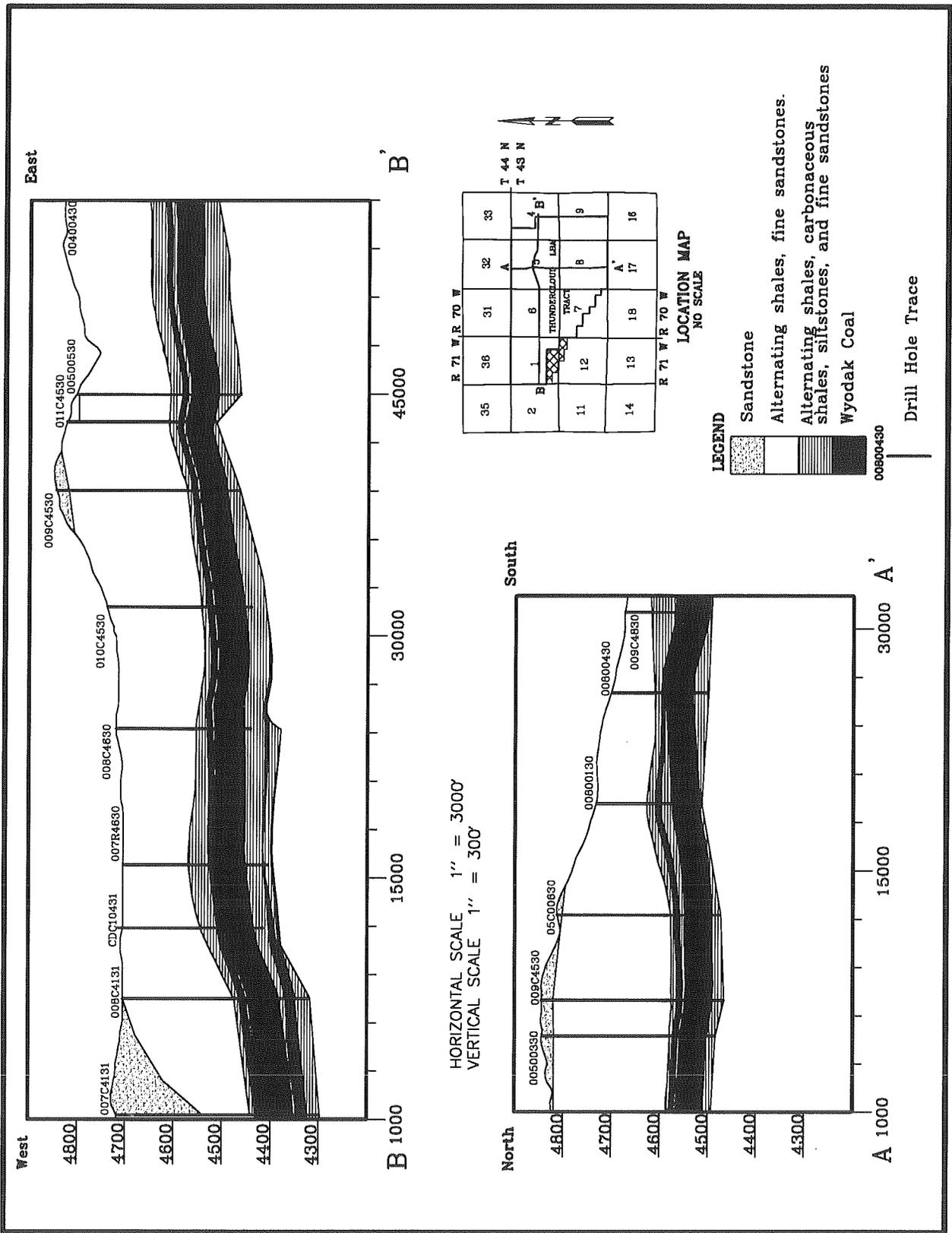


Figure 3-2 North-South and East-West Geologic Cross Sections, Thundercloud LBA Tract.

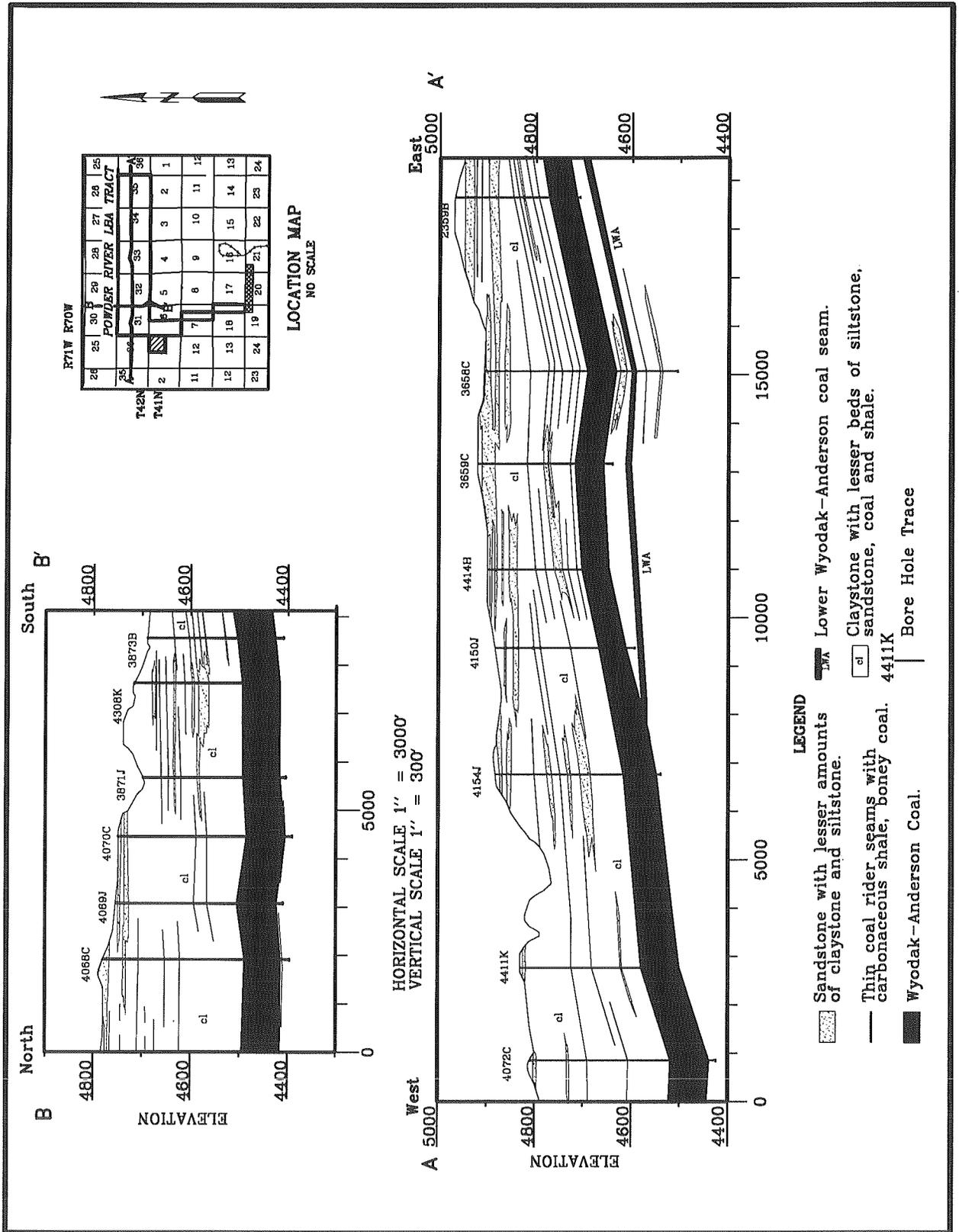
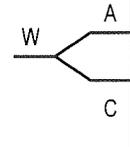


Figure 3-3. North-South and East-West Geologic Cross Sections, Powder River LBA Tract

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, 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 with considerably better water quality which does meet the Class I standard.
FORT UNION FORMATION PALEOCENE	TONGUE RIVER MEMBER 	The coal serves as regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arises almost entirely from fractures. Coal water typically does not meet Class I or Class II use standards. In most cases, water from coal wells is suitable for livestock use. The coal is used throughout the region as a source of stock water and occasionally for domestic use.
	LEBO MEMBER	The Lebo Member, also referred at 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 gallons per minute 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 commonly 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 predominately 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 sulfate as the predominant ions in solution.

W = WYODAK COAL; A = ANDERSON COAL; C = CANYON COAL

Figure 3-4. Stratigraphic relationships and hydrologic characteristics of latest Cretaceous and early Tertiary and Recent periods. Powder River Basin, Wyoming.

3.0 Affected Environment

depths, i.e., nearest the outcrop. An 18th active mine (Dave Johnston) is located near Glenrock, Wyoming, about 25 miles southwest of the Antelope Mine.

The Wyodak coal seam is subbituminous and is generally a low-sulfur, low-ash coal. Based on 59 analyses taken in the Gillette area, this coal seam has an average heating value of approximately 8,220 British thermal units (Btu's) per pound and contains an average of 6% ash, 0.5% sulfur, 30.7% volatile matter, 33.5% fixed carbon, and 29.8% moisture (Glass and Jones 1992). In general, the Wyodak coal in the southern PRB, including these LBA tracts, has a higher heating value than in the area north of Gillette and commands a slightly higher market price. In 1994, the average delivered quality of the coal at North Antelope Mine was as follows: 8,839 Btu/lb, 4.6% ash, 0.23% sulfur, and 0.51 lbs sulfur dioxide per million Btu (lbs/mmBtu). At Rochelle Mine, the 1994 average delivered quality of the coal was 8,738 Btu/lb, 4.53% ash, 0.21% sulfur, and 0.48 lb/mmBtu sulfur dioxide. For Jacobs Ranch Mine, the respective values are 8,628 Btu/lb, 4.48% ash, 0.45% sulfur, and 1.05 lb/mm Btu sulfur dioxide (Vogler, Larsen and Mehring 1995). Other coal seams in the LBA tracts are either too thin and discontinuous or too deep to be of economic value.

Oil and Gas. Although the PRB is primarily an oil-producing province, large quantities of natural gas are associated with the crude oil. Oil and gas have been produced in the region 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 from a number of formations of varying geologic ages in the PRB. The estimated mean amount of undiscovered hydrocarbons in the basin are 1.94 billion barrels of recoverable oil and

1.60 trillion ft³ of gas (USGS 1995). Depth to oil-bearing strata is generally between 4,000 ft and 13,500 ft, but some of the older wells are as shallow as 400 ft.

Both LBA tracts overlie geologic structures that contain producible quantities of oil and gas. The Thundercloud LBA Tract overlies a portion of the Hilight Field, which was discovered in 1969. The main zone of production at the Hilight Field is the Early Cretaceous Muddy Sandstone, which lies approximately 9,000 feet below the surface in this area.

The Powder River LBA tract overlies part of the Porcupine Field, discovered in 1972, and the Payne Field, discovered in 1969. The primary zones of production in these fields are the Late Cretaceous Turner and Sussex Sandstones, which lie between 7,000 and 8,000 feet below the surface. See Section 3.11 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. The methane may also migrate upward and be trapped in shallower rocks (like sandstone), or it may disperse to the atmosphere. 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. The geologic conditions that can enhance methane entrapment at shallow depths include low matrix porosity and permeability in the coals, association of the gas with structurally high features in structurally deformed areas, and the existence of effective seals (Law and others

1991). Without the existence of one or more of these 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 in the basin. However, a large amount also remains in the coal, probably due primarily to the presence of effective seals in the sediments overlying the coal.

Historically, methane has been reported flowing from shallow water wells and coal exploration wells 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 T54N, R74W, which began producing gas for domestic use in 1916.

Coal bed methane has been commercially produced since 1989 at Rawhide Butte Field, west of the Amax Eagle Butte Mine. Since that time, the production area has been expanded. In August 1997, coal bed methane was produced from 206 wells in an area that extends from north of Gillette almost to Wright (see Figure 1-1). There were 73 additional wells in that area that have produced coal bed methane in the past but did not produce in August 1997.

There is no coal bed methane production in the vicinity of the Thundercloud and Powder River LBA Tracts at this time. Coal bed methane projects are, however, in testing or commercial stages between Gillette and Wright (BLM 1992a; BLM 1995), and production is now reported as far south as T45N, R71W. The BLM recently evaluated additional development of coal bed methane on federal oil and gas leases south of Gillette in an EIS (BLM 1997). There are currently

no proposals or applications to develop coal bed methane on the Powder River LBA Tract. On the Thundercloud LBA Tract, the current operator of the Hilight Oil and Gas Field has indicated that coal bed methane development may take place by perforating existing deeper gas wells. If coal bed methane resources can be economically developed in and near the LBA tracts, then exploration is likely to continue. In the PRB, methane is typically recovered by the drilling and completion of wells similar to, but generally shallower than, conventional oil and natural gas wells.

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 LBA tracts.

Uranium. Uranium exploration and mining were very active in the 1950's, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply decreased uranium mining activities in the early 1980's; however, substantial uranium reserves exist in southwestern Campbell and northwestern Converse Counties. There are currently two in-situ leach operations in the PRB, and the recent price increase in uranium has raised interest in developing additional sites in the PRB and elsewhere in Wyoming (WSGS 1996). No known uranium reserves exist on the LBA tracts.

Scoria. Scoria or clinker has been and continues to be a major source of gravel for

3.0 Affected Environment

road construction in the area. Scoria is present along the exposed outcrop of the Wyodak coal seam located along the east sides of the mines, although scoria is not present on the LBA tracts.

3.4 Soils

The soils on the LBA tracts are typical of the soils that occur on the adjoining Jacobs Ranch and North Antelope/Rochelle Mines. Both LBA tracts and adjacent areas have been covered by Order 1-2 soil surveys. All soil surveys were completed in accordance with WDEQ/LQD Guideline No. 1 which outlines required soils information necessary for a coal mining operation. 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 Thundercloud and/or Powder River LBA Tracts and proposed affected area. The soils considered hydric are so noted (Soil Conservation Service 1991).

Absted Loam
Absted-Openay-Arvada Complex
(hydric in depressions)
Abstinate
Aeric Haplaquepts
Arvada Loam (hydric
in depressions)
Bidman Loam
Bowbac Sandy Loam
Briggsdale Loam
Briggsdale-Cushman Complex
Cambria Clay Loam
Cushman Fine Sandy Loam
Decolney Sandy Loam
Felix Clay (hydric in depressions)

Forkwood Loam
Haverdad Loam (hydric)
Heldt Clay Loam (hydric in
depressions)
Hiland Sandy Loam
Kishona Sandy Loam
Olney Rock Outcrop
Parmleed Clay Loam
Pugsley Fine Sandy Loam
Rauzi Sandy Loam
Renohill Clay Loam
Samday Clay Loam
Samsil
Shingle Clay Loam
Shingle-Rock Outcrop Complex
Shingle-Samday-Rock Outcrop
Taluze Sandy Loam
Taluze-Rock Outcrop Complex
Terro Sandy Loam
Theedle Loam
Turnercrest Sandy Loam Variant
Ulm Clay Loam (hydric)
Vona Very Fine Sandy Loam
Vonalee Sandy Loam
Worf Sandy Loam

The identified map units comprised either a single soil series, series phase, variant, tax adjunct or a combination of the above.

Table 3-1 provides the extent of five depth classes of suitable topsoil within the Powder River LBA Tract and the proposed overstrip area. Table 3-2 provides the extent of five depth classes of suitable topsoil within the Thundercloud LBA Tract and proposed disturbance area. The most suitable topsoil is planned to be salvaged and used for reclamation. An average of 18 to 24 inches of topsoil will be redistributed on all disturbed acres. Areas of unsuitable soils include sites disturbed by oil and gas development and soils with high alkalinity, salinity or clay content.

Table 3-1. Acres of Topsoil Available for Reclamation within the Powder River LBA Tract Lease Area and the Entire Area Which Would Be Disturbed by Mining Activities

	Thickness of Suitable Topsoil (inches)													
	0			1-10			10-20			20-40			40-60	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lease Area	28.50	0.7	551.3	13.7	850.5	21.2	1368.6	34.1	1221.8	30.5				
Disturbance Area ¹	51.10	0.6	930.6	9.7	1569.0	18.4	2604.1	31.6	2772.9	39.6				

¹ The disturbance area includes the lease area and adjacent areas which may be affected by mining this lease area as an extension of existing operations.

Table 3-2. Acres of Topsoil Available for Reclamation within the Thundercloud LBA Tract Lease Area and the Entire Area Which Would Be Disturbed by Mining Activities

	Thickness of Suitable Topsoil (inches)													
	0			1-10			10-20			20-40			40-60	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lease Area	481	14	468	14	90	3	2381	69	0	0				
Disturbance Area ¹	519	14	488	13	99	3	2643	70	0	0				

¹ The disturbance area includes the lease area and adjacent areas which may be affected by mining this lease area as an extension of existing operations.

3.0 Affected Environment

The soil depths and types on both LBA tracts are similar to soils currently being salvaged and utilized for reclamation at the adjacent mines and other mines in the PRB, and both tracts are expected to have an adequate quantity and quality of soil for reclamation. Inclusions of hydric soils (soils that are saturated, flooded, or ponded long enough to develop anaerobic [no oxygen] conditions) are found only on the floors of the larger playas in the LBA areas. The site-specific soil surveys have located hydric soils and/or inclusions of hydric soils, and the presence of hydrophytic vegetation and wetland hydrology will be determined during jurisdictional wetland determinations included in the mine permit application package (see Section 3.8).

3.5 Air Quality

Wind speeds for the region average from 9 to 13 miles per hour with local variations due to differences in topography. Winds are predominantly from the northwest or the

southeast and tend to be strongest in the winter and spring and calmer in the summer. Wind velocity tends to increase during the day and decrease during the night (KMCC 1995). Wind roses, air quality and meteorological sampling locations for the North Antelope/ Rochelle and Jacobs Ranch Mines are depicted on Figures 3-5 and 3-6, respectively.

The air quality of the PRB area is generally good with an average annual geometric mean (the nth root of the product of n numbers) for total suspended particulates (TSP) concentrations of 15 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Average particulate concentrations in the basin are therefore one-tenth the maximum allowable concentration in Wyoming (see Table 3-3). Visibility for more than 60 miles is common. Major reductions in visibility are generally weather-related, although forest fires to the west and northwest have impaired visibility in the PRB in past years.

Table 3-3. Regulated Air Emissions for Wyoming

Emissions	Averaging Period	Wyoming Standard ($\mu\text{g}/\text{m}^3$)	National Standard ($\mu\text{g}/\text{m}^3$)
Total suspended particulates (TSP)	24-hour ¹	150	---
Particulate matter finer than 10 microns (PM ₁₀)	24-hour ¹	150	150
	annual ²	50	50
Nitrogen oxides (NO _x)	annual ²	100	100
Photochemical oxidants (O ₃)	1-hour ¹	160	235
Sulfur dioxide (SO ₂)	3-hour ¹	1,300	---
	24-hour ¹	260	365
	annual ²	60	80
Carbon monoxide (CO)	1-hour ¹	40,000	40,000
	8-hour ¹	10,000	10,000

¹ Standards not to be exceeded more than once per year.

² Annual arithmetic mean not to be exceeded.

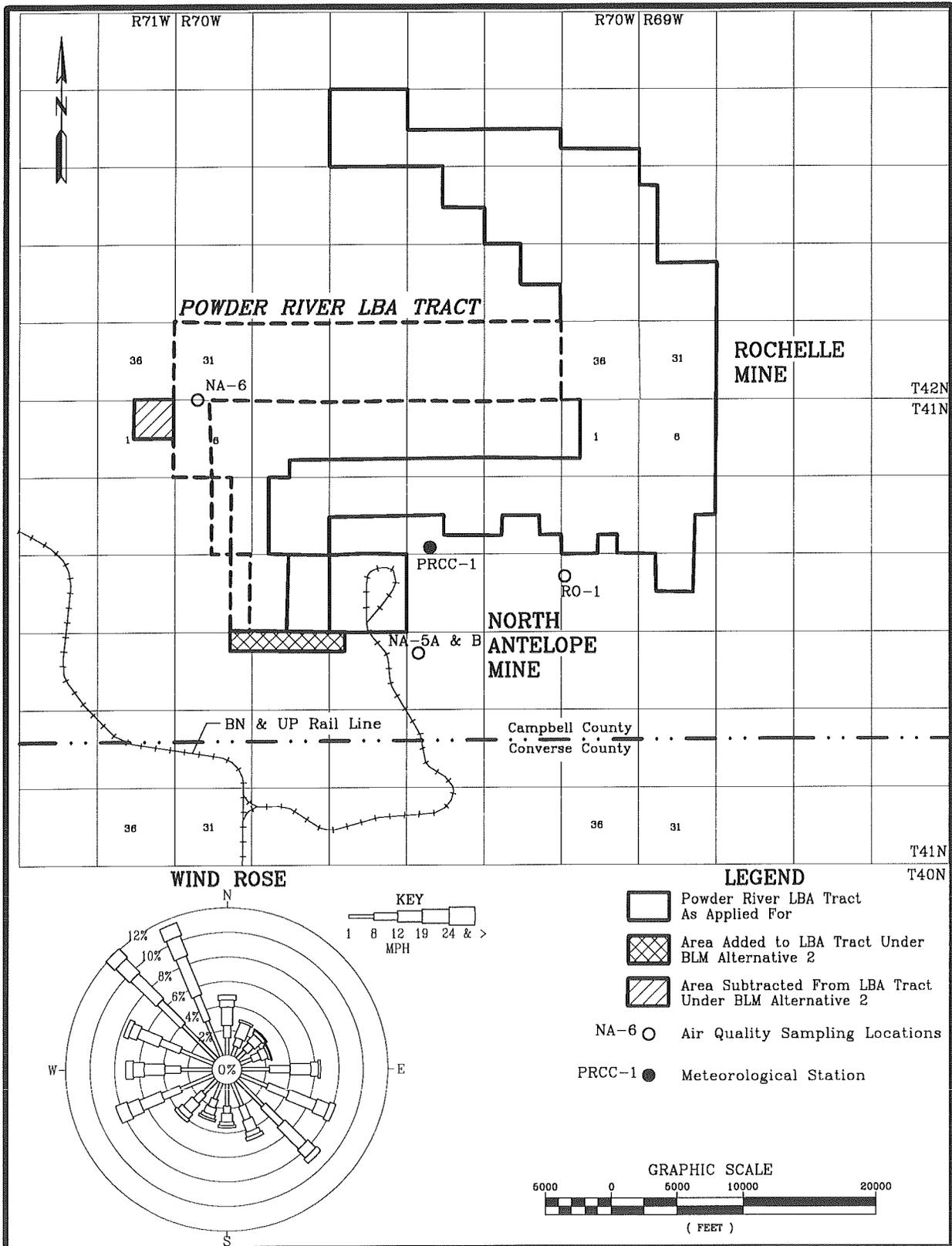


Figure 3-5. Wind Rose, Air Quality and Meteorological Stations at the North Antelope and Rochelle Mines.

3.0 Affected Environment

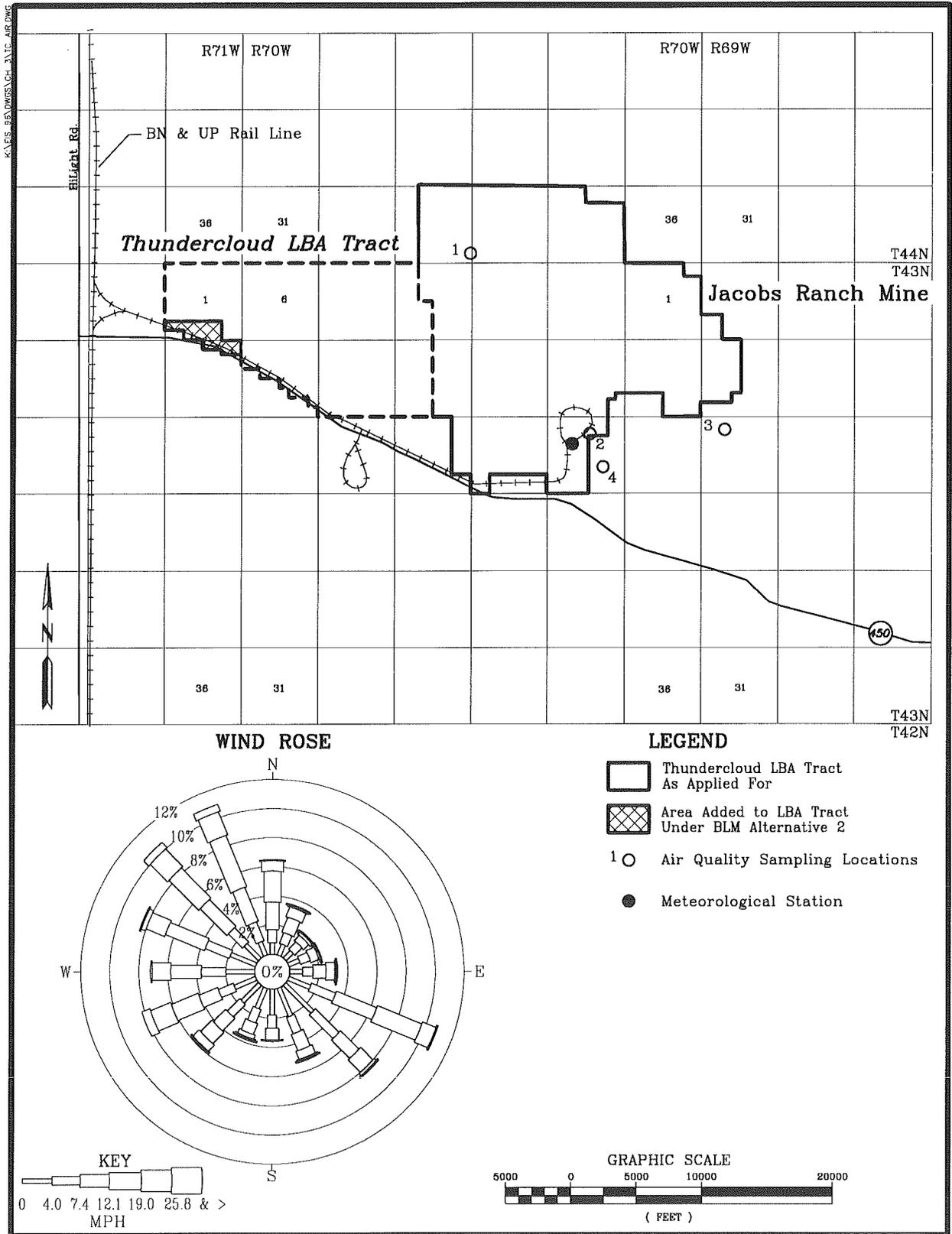


Figure 3-6. Wind Rose, Air Quality and Meteorological Stations at the Jacobs Ranch Mine.

The basic regulatory framework governing air quality in Wyoming is the Wyoming Environmental Quality Act, the accompanying Air Quality Standards and Regulations promulgated by the Wyoming Environmental Quality Council, and the State Implementation Plan approved by the EPA under the Clean Air Act. This regulatory framework includes state air quality standards, which must be at least as stringent as National Ambient Air Quality Standards, and allowable increments for the prevention of significant deterioration (PSD) of air quality. The PSD program is designed to protect air quality from significant deterioration in areas already meeting state standards. In other words, an increase in ambient air pollutant concentrations, above the area baseline, is allowable if the state standard increment for the pollutant is not exceeded for the area. The increment allowable under PSD depends on the area's designation as Class I, II, or III. Class I areas are allowed the smallest increment and Class III the largest. The area the coal mines are located in is Class II, as is all of Wyoming outside the national parks and wilderness areas. The Class I area that is closest to the Thundercloud and Powder River LBA Tracts is Wind Cave National Park in southwestern South Dakota. This national park is approximately 80 miles east

of the Thundercloud and Powder River LBA Tracts. Wyoming's PSD standards for particulates are identical to federal standards, except that Wyoming has not adopted Class III standards (see Table 3-4). Coal mining around the Thundercloud and Powder River LBA Tracts is not currently affected by the PSD regulations because surface coal mines are not one of the 28 EPA-listed major emitting facilities for PSD regulation, and point-source emissions from these mines do not exceed the PSD emissions threshold for applicability of 250 tons per year.

Particulates are the major emissions at surface coal mines. The large areas of disturbed land, blasting, crushing, loading, and hauling of coal associated with mining all produce dust. Wyoming's ambient air standards for particulate matter include standards for both PM_{10} , which includes particles 10 micrometers or less in diameter, and for TSP, which refers to total suspended particulates. The current PM_{10} standards in Wyoming are an annual average of $50 \mu\text{g}/\text{m}^3$ and a 24-hour average of $150 \mu\text{g}/\text{m}^3$. The current Wyoming TSP standard is a 24-hour average of $150 \mu\text{g}/\text{m}^3$. The 24-hour standards are not to be exceeded more than once per year.

Table 3-4. Maximum Allowable Increases for Prevention of Significant Deterioration of Air Quality: Particulates

Emission	Averaging Time	Maximum Allowable Increments of Deterioration ($\mu\text{g}/\text{m}^3$)		
		Class I	Class II	Class III
Total Suspended Particulates (TSP)	Annual Mean	5	19	37
	24-hour ¹	10	37	75

¹ Maximum allowable increment may be exceeded once per year at any receptor site.

3.0 Affected Environment

The various motor vehicles used in mining and transporting coal and people produce carbon monoxide, nitrogen oxides, sulfur dioxide and, by secondary processes, ozone. However these pollutants are seldom emitted at levels to cause regulatory concerns at Wyoming's surface coal mines (Table 3-3).

WDEQ/AQD has presented testimony in public hearings documenting that the air quality resource in the region including the Thundercloud and Powder River LBA Tracts did not diminish from 1980 through 1988, although coal production in the region increased substantially during that period. Air quality particulate data from that report is summarized in Table 3-5. To summarize the monitoring data in comparative form, averages of the geometric means from all sites were calculated for each calendar year. The averages ranged from a high of 30.8

$\mu\text{g}/\text{m}^3$ in 1980 to a low of 20.5 $\mu\text{g}/\text{m}^3$ in 1986. During the period covered in Table 3-5, the number of mines producing coal in the Wyoming portion of the PRB increased from 10 to 16 (considering North Antelope and Rochelle as one mine), while annual coal production escalated from 58.8 million tons to 139.1 million tons. The number of mines monitoring air quality increased from 12 to 16. The number of actual monitoring sites varied from a low in 1980 of 29 to a high of 46 in 1986. In 1988 there were 45 operating sampler sites. (Some sites included more than one sampler, so the number of samplers is greater than the number of monitoring sites.) Over 23,000 samples are represented in Table 3-5. The information presented by the WDEQ/AQD shows that air quality in the Wyoming portion of the PRB did not deteriorate while coal production increased nearly 2.5 times in the 1980-1988 period.

Table 3-5. Summary of WDEQ/AQD Report on Air Quality Monitoring in Wyoming's Powder River Basin, 1980-1988

Year	Number of Mines Producing/ Monitoring	# Sites	Coal Produced (MMTPY ¹)	Overburden (MMBCY ¹)	TSP Average of All Geometric Means ($\mu\text{g}/\text{m}^3$)
1980	10/12	29	58.8	93.2	30.8
1981	11/13	34	68.9	108.0	30.4
1982	11/15	43	81.4	120.7	23.1
1983	13/15	41	88.0	157.2	24.3
1984	14/15	44	106.8	166.6	24.3
1985	16/15	45	113.8	196.3	24.3
1986	16/16	46	114.6	169.6	20.5
1987	16/16	45	124.6	180.9	25.6
1988	16/16	45	139.1	209.8	29.3

Notes: 1. Mines include Buckskin, Rawhide, Eagle Butte, Fort Union, Clovis Point, Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero, Coal Creek, Jacobs Ranch, Black Thunder, North Antelope/Rochelle, Antelope, and North Rochelle.
2. From WDEQ/AQD 1989 (This study has not been updated).

¹ MMTPY = million tons per year, MMBCY = million bank cubic yards

This is due in part to the conditions attached to air quality permits. These conditions stipulate control measures that must be implemented by the mine operators to meet air quality standards. These measures include increased sprinkling, use of approved chemicals to control dust, limiting the amount of disturbed area, temporary vegetation of disturbed areas, and contemporaneous reclamation. In the mining areas immediately adjacent to the Thundercloud and Powder River LBA Tracts, historical particulate ambient air quality data shows the same result for the Jacobs Ranch, North Antelope, and Rochelle mines as described above for the PRB as a whole. Figure 3-7 presents particulate ambient air data and mine coal and overburden quantities for the years 1991 through 1995 for those mines. As the figure illustrates, substantial increases of coal production and overburden handled by the mines have not been accompanied by any similar increase in ambient concentrations of TSP and PM_{10} .

Before adoption of the current annual PM_{10} standard, the annual particulate standard was $60 \mu\text{g}/\text{m}^3$ of TSP (geometric mean). As Figure 3-7 shows, the annual TSP averages are well below this former standard. Assuming that PM_{10} (which was not monitored during all the years at all the sites shown in the figure) was about 30% of the TSP values (as determined by the WDEQ/AQD based on many years of results from co-located TSP and PM_{10} samplers), and assuming that the geometric and arithmetic means of TSP data are similar, it can be inferred from Figure 3-7 that the Jacobs Ranch, North Antelope, and Rochelle Mines have historically been well within the current annual PM_{10} standard of $50 \mu\text{g}/\text{m}^3$.

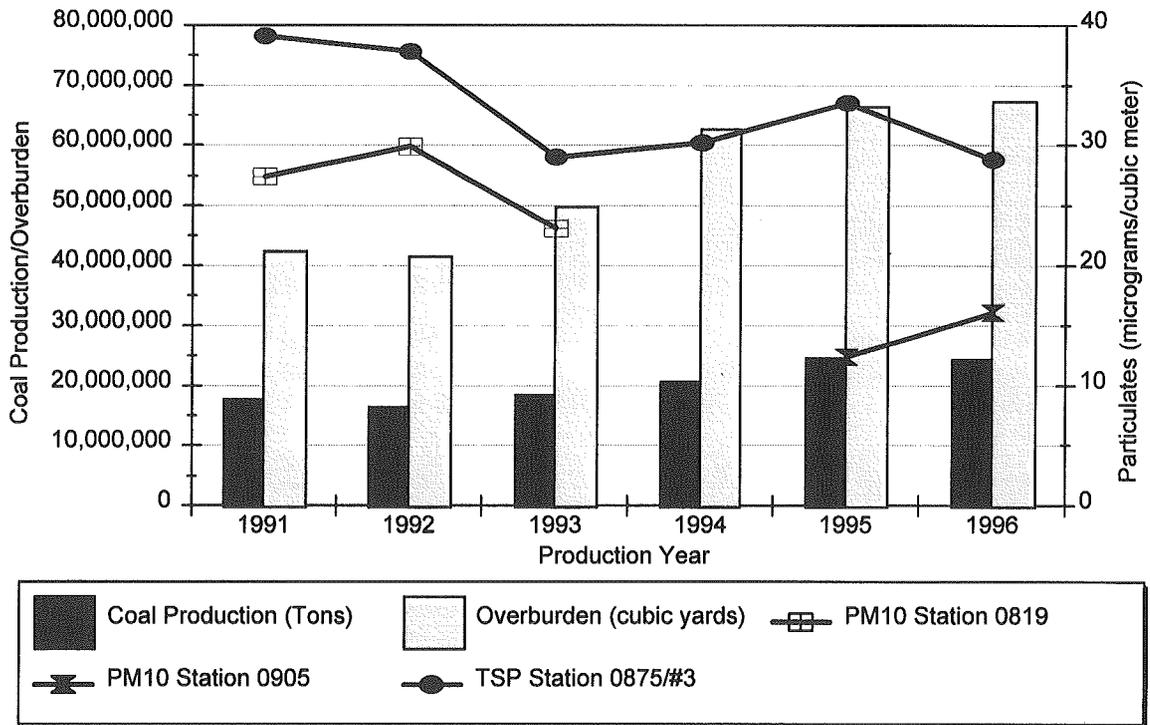
The 1989-1994 TSP data from nearly 1600 samples collected at the Jacobs Ranch, North Antelope, and Rochelle Mines indicate that emissions have not caused any violation of the current standard. From 1989 to 1994, the TSP geometric means for the Jacobs Ranch, North Antelope, and Rochelle Mines, in micrograms per cubic meter, using the same averaging techniques applied to Table 3-3, are as follows: 1989 = 20.91; 1990 = 25.63; 1991 = 25.16; 1992 = 24.23; 1993 = 25.86; and 1994 = 31.79 (WDEQ/AQD Annual Reports for the calendar monitoring years 1989 through 1994.)

3.6 Water Resources

3.6.1. Groundwater

Within both the Thundercloud and Powder River LBA Tracts there are three water-bearing geologic units that could be disturbed by mining. In descending order, these units are: Recent alluvium that occurs in varying amounts adjacent to the stream channels within the LBA tracts, the Wasatch Formation overburden and the Wyodak coal seam. A fourth unit, the sub-coal Fort Union Formation, is used for water supply at Jacobs Ranch and neighboring mines including North Antelope and Rochelle. A fifth unit, the Lance Formation, is also utilized for water supply by PRCC at the North Antelope and Rochelle Mines. The stratigraphic units beneath the two LBA tracts and their hydrologic properties are displayed in Figure 3-4. Because the hydrogeology of the two LBA tracts is similar, a general hydrogeologic discussion can be used to describe both sites. However, there is enough variability in the hydrogeologic units between the sites that site-specific descriptions are included where appropriate.

Kerr McGee Coal Corporation Jacobs Ranch Mine



Powder River Coal Company North Antelope Mine and Rochelle Mine

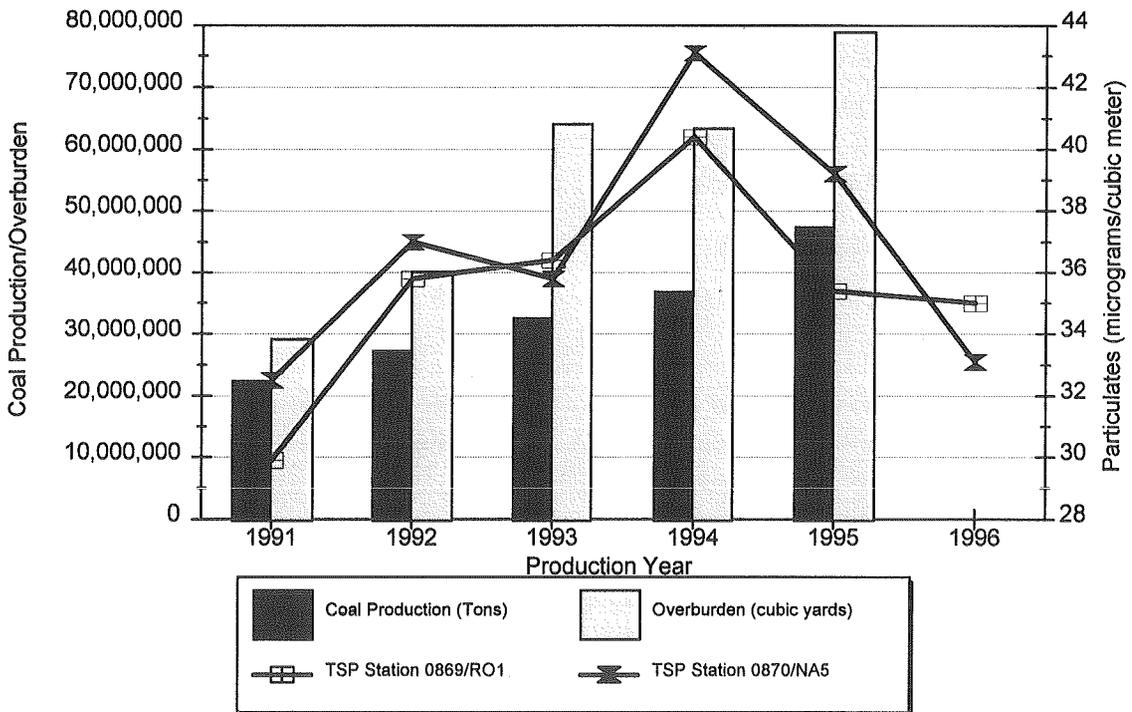


Figure 3-7. Coal Production vs. Ambient Particulates for Jacobs Ranch, North Antelope and Rochelle Mines.

PRCC and KMCC have collected hydrogeologic data at the respective LBA tracts. Monitoring wells have been installed in both tracts. Figure 3-8 shows the monitoring well locations within the Powder River LBA Tract, and Figure 3-9 shows the monitoring well locations within the Thundercloud LBA Tract. The Powder River LBA Tract contains 32 wells; six are completed in the Recent alluvium, 12 in the Wasatch Formation overburden, and 14 in the Wyodak-Anderson coal seam. The Thundercloud LBA Tract contains 11 monitoring wells; five are completed in the Wasatch Formation overburden and six are completed in the Wyodak coal seams. Data from these wells, as well as previously collected data at both the Jacobs Ranch and North Antelope/Rochelle Mines, were used to prepare the following description of baseline groundwater conditions within the LBA tracts.

Recent Alluvium

Within the Thundercloud LBA Tract, the surface drainages are generally dry draws, and the alluvium along these draws is generally thin, fine-grained, and not extensive enough to be considered an aquifer. The alluvial deposits within the Powder River LBA Tract are more extensive than in the Thundercloud LBA Tract, particularly along Porcupine Creek, where the alluvium is up to 1000 ft wide and as much as 12 ft thick. Alluvium also is present along Corder Creek, a tributary of Porcupine Creek, although it is much narrower (about 200 ft wide) and about 10 ft thick. Studies conducted by PRCC on the alluvium of Porcupine and Corder Creeks within the LBA tract indicate that the alluvial hydraulic conductivity (a measure of the rate at which water moves through alluvial materials) is also variable, ranging from 1.1 to 13 ft/day. The alluvial aquifer receives recharge from

the infiltration of precipitation, from lateral movement of groundwater from the adjacent Wasatch Formation, and from infiltration of surface flow within the channels.

Water quality data collected from wells completed in the Porcupine Creek alluvium within the Powder River LBA Tract indicate that total dissolved solids (TDS) concentrations in the alluvial groundwater range from 2,300 to 12,400 milligrams per liter (mg/L) with a mean of 7,250 mg/L (PRCC 1996). Within the Powder River LBA Tract, the high TDS concentrations in the alluvial groundwater generally preclude its use even for livestock watering.

Wasatch Formation

The Wasatch Formation overlies the Wyodak coal beds and is generally similar within the two LBA tracts. Within the PRB the Wasatch Formation consists of interbedded sandstones, siltstones and shale with occasional discontinuous coal stringers and clinker deposits, and this description holds true for both the LBA tracts. The sandstone and coal stringers, where saturated, will yield water to wells, and this groundwater is often used for stock watering. Because the sandstone and coal aquifer units within the Wasatch Formation are not continuous, the Wasatch is not considered to be a regional aquifer.

Recharge to the Wasatch Formation is from the infiltration of precipitation and lateral movement of water from adjacent clinker bodies. Regionally, groundwater is discharged from the Wasatch Formation by evaporation and transpiration, by pumping wells, and by seepage into the alluvium along stream drainages. For the Wasatch Formation as a whole, the discontinuous nature of the water bearing units results in low overall hydraulic conductivity and low

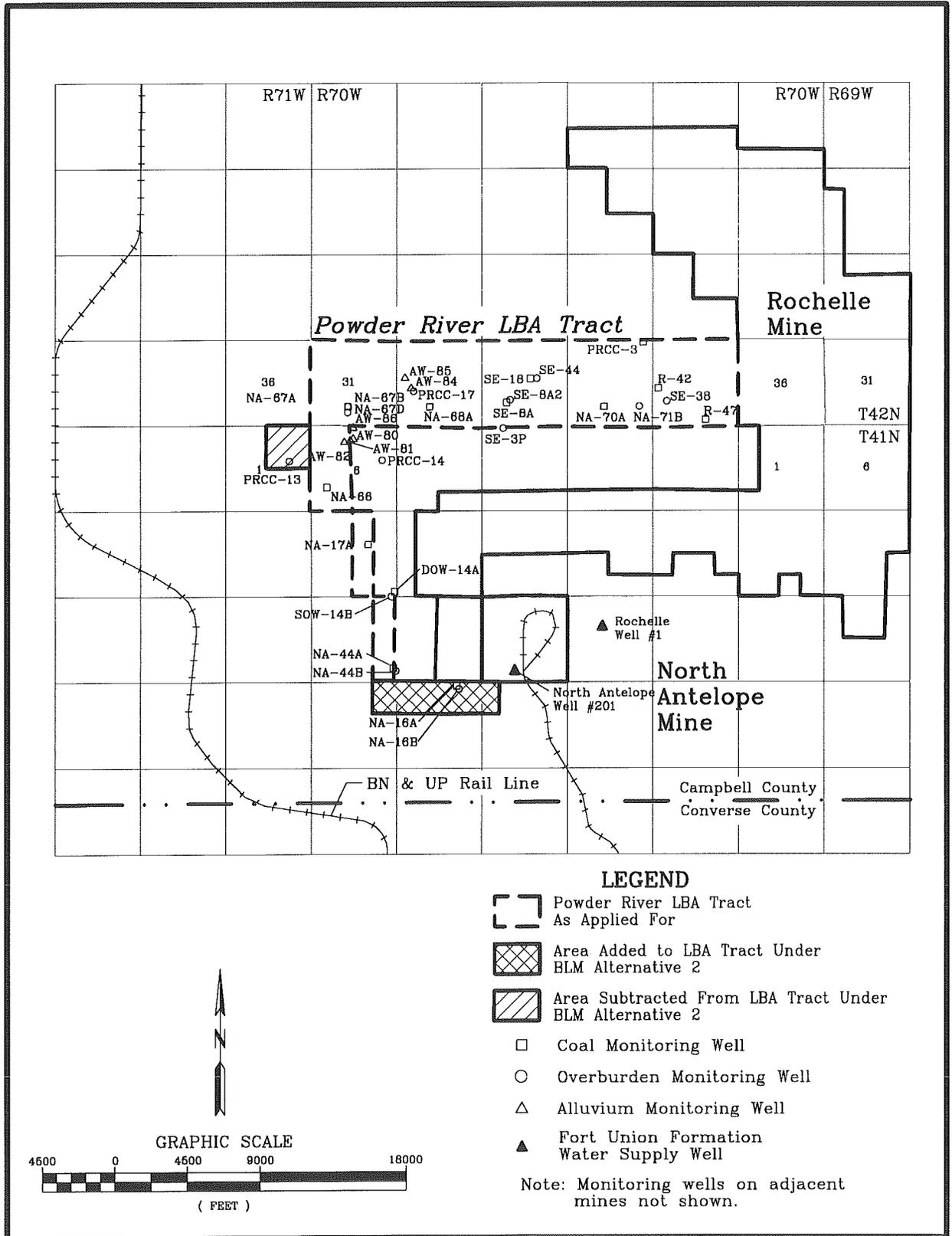


Figure 3-8. Monitoring Well Locations Within the Powder River LBA Tract and Fort Union Formation Water Supply Well Locations at the North Antelope and Rochelle Mines.

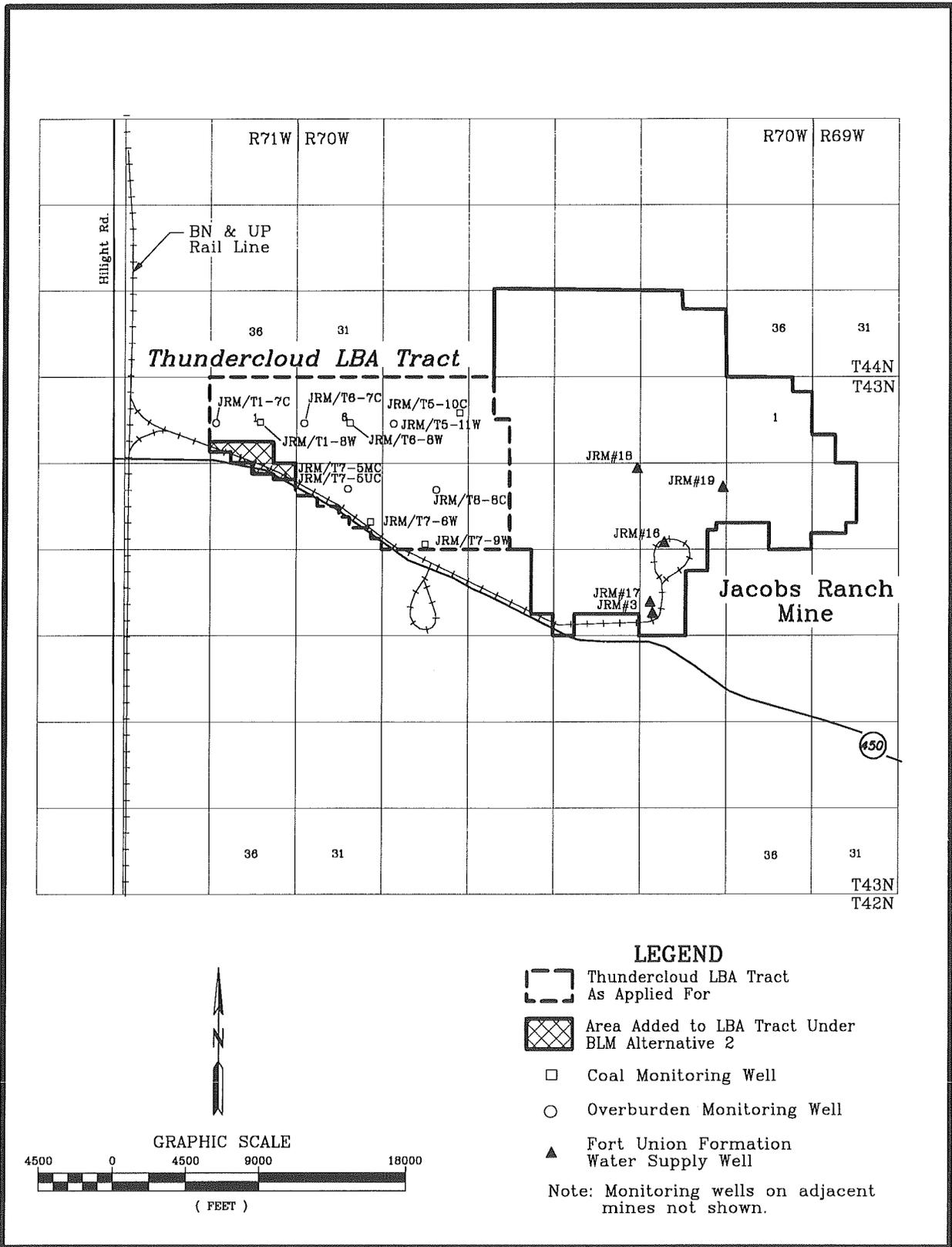


Figure 3-9. Monitoring Well Locations Within the Thundercloud LBA Tract and Fort Union Formation Water Supply Well Locations at the Jacobs Ranch Mine.

groundwater flow rates. Because of the varied nature of the aquifer units within the Wasatch, hydraulic properties are variable as well. Martin, et al. (1988) reported that hydraulic conductivities within the Wasatch ranged from 10^{-4} ft/day to 10^2 ft/day and the geometric mean hydraulic conductivity based on 203 tests was 0.2 ft/day. The geometric mean hydraulic conductivity from 70 aquifer test using wells completed in sandstone in the Wasatch overburden was 0.35 ft/day, while that from 63 aquifer tests completed in siltstone and claystone in the Wasatch overburden was 0.007 ft/day (Rehm et al. 1980). The Wasatch Formation within the Thundercloud and Powder River LBA Tracts is similar in that there is relatively little saturated sand present within the low-permeability silts and clays that make up most of the overburden.

Water quality in the Wasatch Formation is variable, with TDS concentrations ranging from 496 mg/L to 4,436 mg/L and averaging 1,915 mg/L in the Thundercloud LBA Tract and from 363 mg/L to 7,364 mg/L and averaging approximately 3,040 mg/L in the Powder River LBA Tract. Groundwater from the Wasatch Formation is of the sodium-sulfate-bicarbonate type within the Thundercloud LBA Tract and of the sodium-bicarbonate type in the Powder River LBA Tract.

Wyodak Coal

Due to its continuity, the Wyodak coal seam is considered a regional aquifer within the PRB. Within the Thundercloud LBA Tract, the Wyodak coal contains partings which in places divide the Wyodak into three mineable seams. At the Powder River LBA Tract, however, the Wyodak coal seam typically consists of one unit.

Hydraulic conductivity (or permeability to water) within the Wyodak coal seam is 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 south 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 the coal fractured by unloading only. Preliminary data collected by KMCC suggest that in the far western part of the Thundercloud LBA Tract, groundwater movement may be controlled by a northwest-southeast trending tectonic fracture system. Likewise, aquifer test data collected by PRCC in the vicinity of the Powder River LBA Tract indicate that the coal possesses higher permeability in the northwest-southeast direction.

Numerous aquifer tests have been performed by PRCC on the Wyodak coal seam within and adjacent to the Powder River LBA Tract. Permeability in the coal in the vicinity of the LBA tract is enhanced due to fracturing and has been measured at up to 25 ft/day at well NA-67A (Figure 3-8). Average coal permeability in the vicinity of the LBA tract, however, is approximately 9.5 ft/day.

Although wells have been installed in the coal aquifer within the Thundercloud LBA Tract, aquifer tests have not yet been conducted. Hydraulic properties of the coal can be expected to be similar to that of the coal within the adjacent Jacobs Ranch and Black Thunder Mine permit areas. Coal permeability measured at the Black Thunder Mine ranges from 0.16 ft/day to 84.6 ft/day, and 0.14 ft/day to 1.6 ft/day at the Jacobs Ranch Mine.

The coal aquifer is deeply confined at both LBA tracts, which results in low storage coefficients. Storage coefficients measured in the vicinity of Powder River LBA Tract range from approximately 5×10^{-4} to 1×10^{-3} . Measured storage coefficient values in the vicinity of the Thundercloud LBA Tract range from 2.7×10^{-4} to 8.3×10^{-4} .

Groundwater from the coal aquifer at the Powder River LBA Tract is of the sodium-bicarbonate type with TDS concentrations ranging from 447 mg/L to 2,020 mg/L and averaging approximately 733 mg/L.

Coal groundwater at the Thundercloud LBA Tract is of the sodium-bicarbonate type, with TDS concentrations ranging from 790 mg/L to 1,042 mg/L. The average for all six coal wells sampled on the Thundercloud LBA Tract is 853 mg/L.

Prior to mining, the direction of groundwater flow within the coal aquifer was generally from recharge areas near the outcrop into the basin, following the dip of the coal. Site-specific water-level data collected by KMCC and PRCC in the vicinity of both respective LBA tracts and presented in the Gillette Area Groundwater Monitoring Organization (GAGMO) 15-year report (Hydro Engineering 1996a) indicate that the groundwater flow directions have been influenced by mining activities. Groundwater

flow within the coal aquifer in the vicinity of both LBA tracts is now toward nearby mine pits.

Subcoal Fort Union Formation

The subcoal Fort Union Formation can be divided into three hydrologic units: the Tongue River aquifer, the Lebo Member, and the Tullock aquifer (Law 1976). The hydrologic units below the coal are not directly disturbed by mining, but many of the mines use them for water supply wells. The Tongue River aquifer consists of lenticular fine-grained shale and sandstone. 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). The Tullock aquifer consists of discontinuous lenses of sandstone separated by interbedded shale and siltstone. Transmissivity is the product of an aquifer's hydraulic conductivity or permeability times its thickness and is commonly used when discussing the hydraulic properties of the Fort Union Formation, where wells are completed by exposing many discrete sand lenses to the well bore. Transmissivities are generally higher in the deeper Tullock aquifer, and many mines in the PRB have water-supply wells completed in this interval (Martin et al. 1988). The average transmissivity for this member as reported in McIntosh, et al. (1984) is 290 ft²/day.

In the vicinity of the Powder River LBA Tract, immediately below the coal, the Tongue River aquifer consists of alternating sandstones, siltstones, and claystones. Measured permeabilities of this sequence are low, averaging approximately 0.6 ft/day (PRCC 1993). Two Fort Union Formation wells are used for mine water supply at the North Antelope and Rochelle Mines. Both

3.0 Affected Environment

wells are approximately 2,000 ft deep. The wells are shown on Figure 3-8.

Near the Thundercloud Tract, KMCC reports that it is difficult to distinguish the Lebo Confining Layer from sand-poor sequences of the overlying Tongue River aquifer and the underlying Tullock aquifer (KMCC 1994). KMCC, therefore, refers only to the Upper and Lower Fort Union Formation. The upper unit consists of the Tongue River aquifer and the lower unit consists of the Tullock aquifer. Transmissivities of the Upper Fort Union Formation at the Jacobs Ranch Mine range from about 110 to 567 ft²/day. Transmissivities of the lower Fort Union Formation at the Jacobs Ranch Mine range from about 190 to 375 ft²/day. KMCC has completed five wells in the subcoal Fort Union Formation to supply water to the Jacobs Ranch Mine. The well depths range from 645 to 1,840 feet. The Jacobs Ranch Mine Fort Union Formation supply wells are depicted on Figure 3-9.

The water quality of the Fort Union Formation is generally good. TDS concentrations measured at Jacobs Ranch Facility Well JRM # 16 average 340 mg/L. Water from this well is of the sodium-bicarbonate type. TDS concentrations for the Fort Union Formation at the North Antelope Mine average approximately 230 mg/L, and 400 mg/L at the Rochelle Mine.

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. The Fox Hills Sandstone and overlying Lance Formation are utilized by PRCC for water supply at the Rochelle Mine, tapped by a 5,400-ft deep well capable of producing about 400 gpm (576,000 gallons per day). Water from this well is of the

sodium-bicarbonate type, with a TDS concentration of about 1,200 mg/L. The Lance and Fox Hills formations are not used by KMCC at the Jacobs Ranch Mine.

3.6.2 Surface Water

The drainage areas of the Powder River LBA Tract and the Thundercloud LBA Tract consist of gently rolling topography. In general, the streams within these areas are typical for the region, and their flow events are closely reflective of precipitation patterns. 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. 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 in the Powder River and Thundercloud LBA tracts are displayed in Figures 3-10 and 3-11, respectively. Both LBA tracts are located within the Cheyenne River drainage basin.

The Powder River LBA Tract includes a small portion of the valley of Porcupine Creek as well as the tributary drainages of Mike Draw and Corder Creek. A short reach of Porcupine Creek crosses the Powder River LBA Tract and drains in a southeast direction toward its confluence with Antelope Creek. In the vicinity of the Powder River LBA Tract, Porcupine Creek is a meandering, ephemeral to intermittent stream into which flow small, gullied ephemeral streams. Porcupine Creek has an approximate gradient of 0.3% and a 15-year

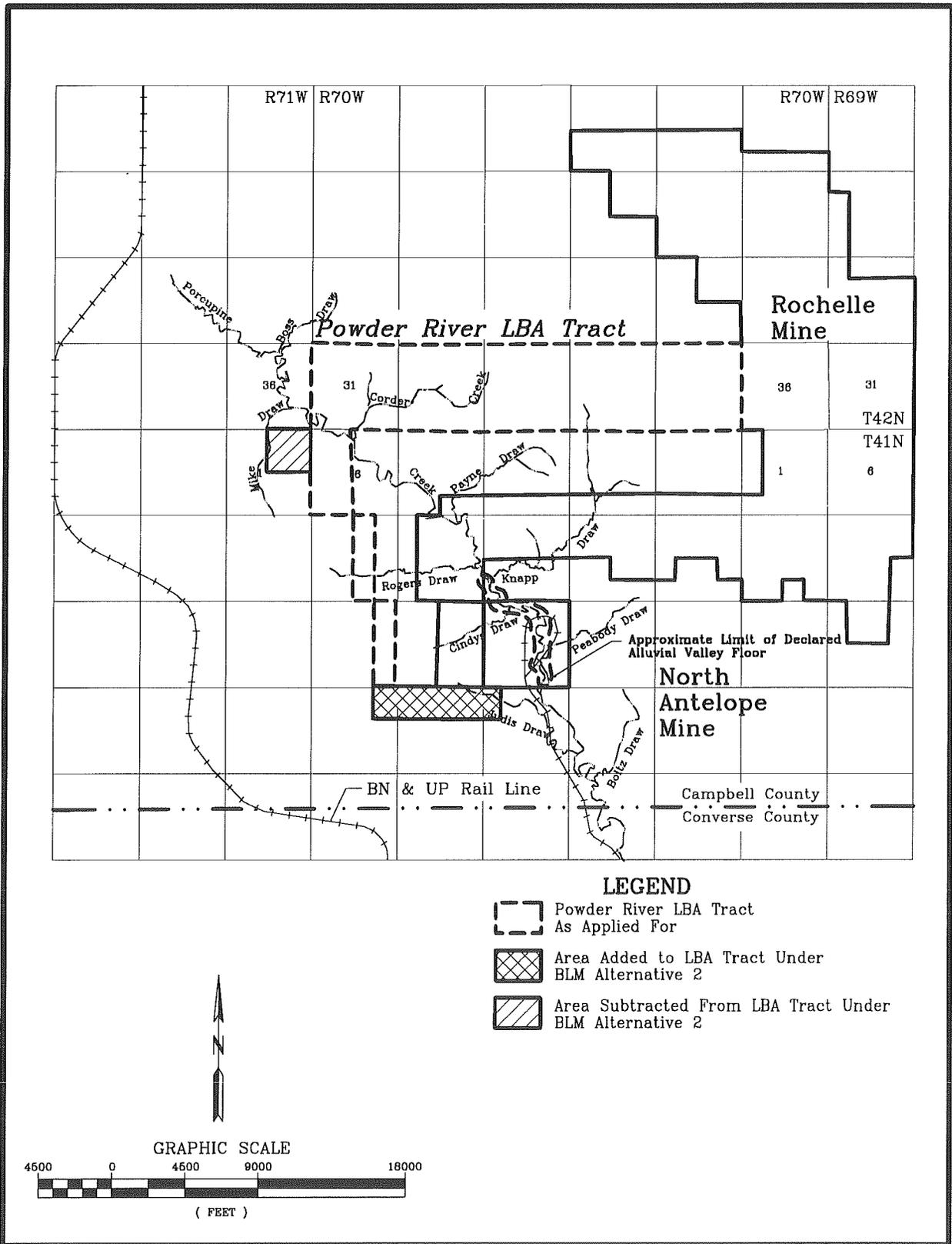


Figure 3-10. Surface Water Features Within and Adjacent to Powder River LBA Tract.

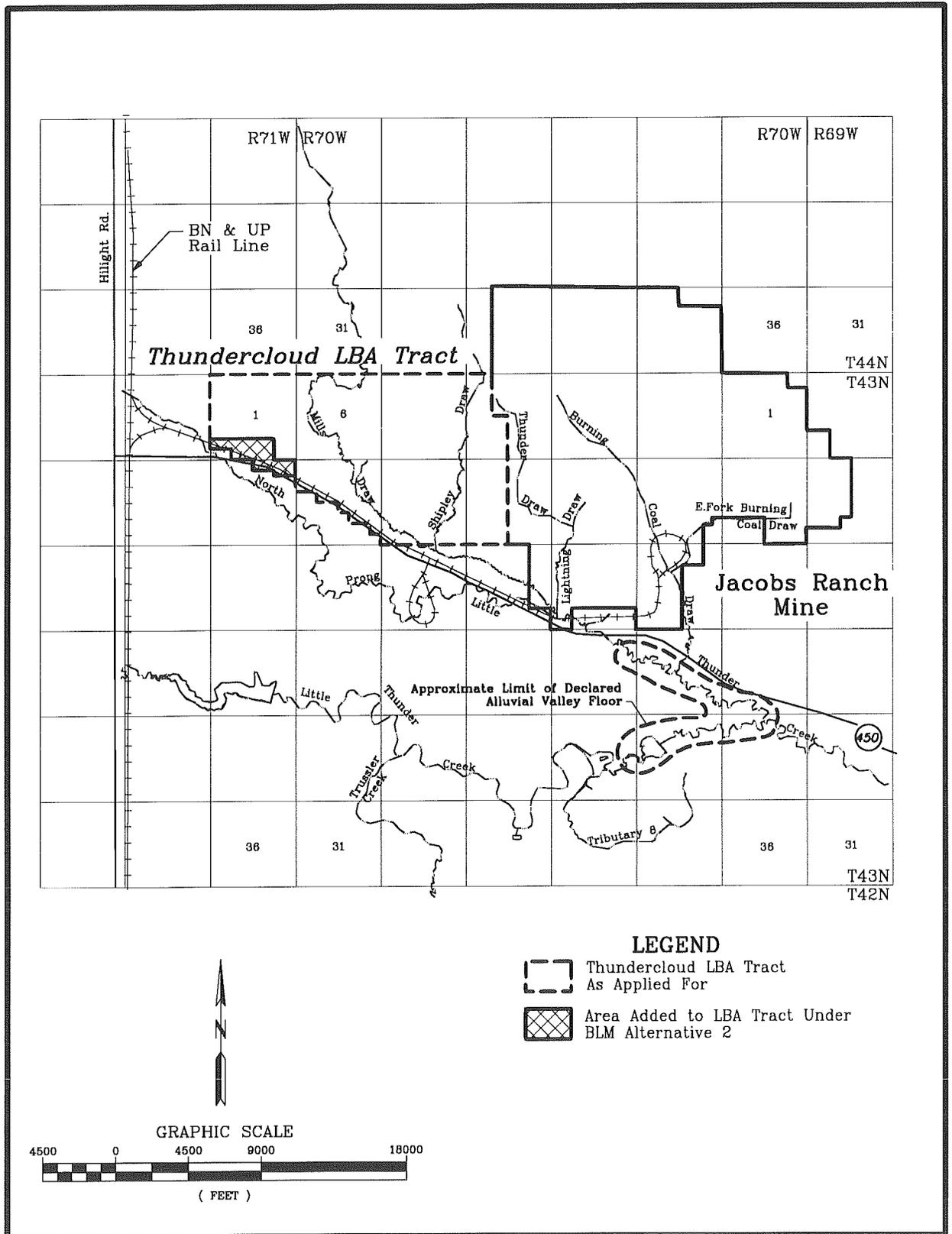


Figure 3-11. Surface Water Features Within and Adjacent to the Thundercloud LBA Tract.

(1981 through 1995) average annual discharge of 10.0 ac-ft/yr (PRCC 1996).

The drainage of Porcupine Creek in and above the Powder River LBA Tract is non-typical of the region in that topography is subdued and drainage density is fairly low. These conditions, combined with numerous upstream reservoirs, result in a much lower annual runoff volume in Porcupine Creek than would otherwise be expected. The water in Porcupine Creek and other local channels comes from three general sources: 1) surface water from the large watershed upstream, 2) groundwater contained in the shallow alluvial aquifer, and 3) lateral inflow of groundwater from surrounding overburden and bedrock.

Porcupine Creek is a typical ephemeral to intermittent stream that flows primarily as a result of snowmelt and general rainstorms in early spring or due to thunderstorms throughout the summer. Thunderstorms in this area are usually short in duration, limited in areal extent, and often characterized by high-intensity rainfall. The isolated events are infrequent and occasionally extreme.

Porcupine Creek within the Powder River LBA Tract shows areas of ponding due to minor discharge of water from the adjacent overburden, but the stream is ephemeral throughout most of the reach. The discharge that is contributed to the drainage from the adjacent overburden is not enough to compensate for evapotranspiration during the summer months, and the stream has extended no-flow periods during each year. Pools in the channel go dry during extended periods of no runoff.

Porcupine Creek has a drainage area of approximately 67 mi² above the Powder River LBA Tract. Corder Creek and Mike Draw have drainage areas of approximately

4.75 mi² and 2.58 mi², respectively. These streams are typical of small ephemeral drainages in the region.

Flows and water quality are monitored by PRCC in Porcupine Creek and several minor tributaries on and near the permit areas, and results are reported annually. The surface water is typically a calcium-sodium-sulfate water and generally contains more than 1,500 mg/L of TDS. This water is usually unsuitable for domestic use, marginal for irrigation, and suitable for stock and wildlife.

The main streams within and near the Thundercloud LBA Tract are North Prong Little Thunder Creek, Shipley Draw, and Mills Draw. These three streams are classified as ephemeral, meaning that they flow only in direct response to snowmelt or precipitation runoff events.

North Prong Little Thunder Creek flows in an easterly direction near the Thundercloud LBA Tract, joining Little Thunder Creek downstream from the Jacobs Ranch and Black Thunder Mines. Little Thunder Creek also flows in an easterly direction and joins Black Thunder Creek, a tributary to the South Fork of the Cheyenne River. North Prong Little Thunder Creek had a total premining drainage area of approximately 72 mi². Due to the presence of numerous closed basins within the drainage area, approximately 23 mi² is non-contributing drainage (KMCC 1993). Therefore, the total contributing drainage area is approximately 49 mi² with a mean annual runoff of approximately 219 ac-ft/yr (KMCC 1993). North Prong Little Thunder Creek exhibits infrequent streamflow events, generally with discharges of less than five ft³ per second. Shipley and Mills Draws are the main streams which contribute streamflow to North Prong Little Thunder Creek in the Thundercloud LBA Tract. The valley of

3.0 Affected Environment

North Prong Little Thunder Creek is generally broad and gentle with a steep southwestern rim. The stream has a mean channel gradient of 0.16% through the Black Thunder permit area with a corresponding elevation drop of 45 ft across the permit area.

Mills Draw and Shipley Draw flow in a southerly direction within the Thundercloud LBA Tract. Mills Draw joins Shipley Draw approximately 500 ft upstream of the confluence with North Prong Little Thunder Creek. The premining drainage area of Mills Draw is 5.5 mi² and mean annual runoff is about 50 ac-ft/yr. The contributing drainage area to Shipley Draw is 3.0 mi² with a corresponding mean annual runoff of about 30 ac-ft/yr. Mean annual runoff calculations for Mills and Shipley Draws were performed using relationships developed by Hadley and Schumm (1961). The topography within Mills Draw and Shipley Draw is characterized by very gentle slopes. The channels are incised near the confluence of Mills Draw and Shipley Draw and grade into grassy swales upstream of the confluence.

Flows and water quality are monitored by the Black Thunder and Jacobs Ranch Mines in Little Thunder Creek and North Prong Little Thunder Creek as well as several minor tributaries on and near the permit areas, and results are reported annually. The native surface water is classified as a sulfate-type water that exceeds WDEQ standards for arsenic, manganese, and TDS, depending on the sample location (KMCC 1993; TBCC 1992). Surface water quality is usually unsuitable for domestic use, marginal for irrigation, and suitable for stock and wildlife.

Little Thunder Creek and North Prong Little Thunder Creek have been diverted to the North Prong Diversion Channel. The diversion channel conveys the streamflows through the Black Thunder permit area to the

Jacobs Ranch permit area to facilitate mining operations at both mines. Small portions of Mills and Shipley Draws have been reclaimed in the Black Thunder permit area.

3.6.3 Water Rights

Records of the Wyoming State Engineer's Office (SEO) were searched for groundwater rights within a 3-mile radius of both the Powder River and Thundercloud LBA Tracts, as required for WDEQ permitting.

SEO data indicate there are 347 permitted water wells within three miles of the Powder River LBA Tract. The majority of these wells (274) are owned by coal mining companies. Of the 73 other wells, 38 are permitted for stock watering purposes, five are permitted for domestic use, two for filling reservoirs, one for industrial purposes, and four for miscellaneous use. The 23 remaining wells are used by the USFS for monitoring purposes.

SEO data indicate there are 238 permitted water wells within three miles of the Thundercloud LBA Tract. The majority of these wells (146) are owned by coal mining companies. Of the 92 other wells, 55 are permitted for stock watering purposes, two are permitted for domestic use, one for filling reservoirs, one for industrial use, one for irrigation use, and five for miscellaneous use. The 27 remaining wells were permitted by the Water Resources Research Institute, predecessor to the Wyoming Water Research Center, for monitoring purposes.

The Wyoming SEO's records were searched for surface water rights using the SEO's AREV program. The search was conducted for surface-water rights within one-half mile of the Powder River and Thundercloud LBA Tracts and three miles downstream from

these tracts, as required for WDEQ permitting.

SEO records indicate 86 permitted surface water rights within the search area for the Powder River LBA Tract. The majority of the surface water rights (59) are held by coal mining companies. Of the 27 other surface water rights, five are ditches or pipelines, two are irrigation storage reservoirs and the remaining 20 surface water rights are for stock watering.

SEO records indicate 47 permitted surface water rights within the search area for the Thundercloud LBA Tract. The majority of the surface water rights (36) are held by coal mining companies. Of the 11 other surface water rights, four are ditches or pipelines, six are stock reservoirs and one is an industrial use reservoir.

3.7 Alluvial Valley Floors

WDEQ regulations define alluvial valley floors (AVF's) as unconsolidated stream laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Prior to leasing and mining, AVF's must be identified because their presence can restrict mining activities. Impacts to designated AVF's 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.

Investigations have been conducted by PRCC, Thunder Basin Coal Company, and KMCC to determine the presence of AVF's on the existing Rochelle and North Antelope, Black Thunder, and Jacobs Ranch mines, and the results of these investigations are discussed below. There is, however, no present or historical record of agricultural use, other than undeveloped rangeland, of the stream-laid deposits within either the Powder River or the Thundercloud LBA tracts. Therefore, if WDEQ determines that AVF's are present on the tracts, it is reasonable to assume that mining will be permitted in those areas because the lack of agricultural development in this area precludes a determination that any of these AVF's will be significant to agriculture.

The North Antelope and Rochelle mine permit areas and adjacent areas, including the Powder River LBA Tract, have been investigated for the presence of AVF's. Reports on AVF's within the current permit areas are included in the North Antelope and Rochelle mine permit documents. There are no declared AVF's in the Rochelle permit area. Along Porcupine Creek, the only area designated as AVF within the North Antelope Mine permit is the extent of stream laid deposits inundated by the agriculturally useful flood, or the 2-yr, 6-hr storm. This classification consists of a very narrow band adjacent to the stream channel.

Porcupine Creek and its tributaries within the LBA tract (Corder Creek and Mike Draw, see Figure 3-10) have been investigated by PRCC for the presence of AVF's in anticipation of preparing an amendment to the mine permit to include the Powder River LBA Tract.

The alluvial deposits along Porcupine Creek consist primarily of a layer of poorly sorted sands and gravels, with some intermixing of

clays and silts, underlain by a layer of moderately well sorted medium sand intermixed with gravel. The groundwater levels in the alluvium show a fairly rapid response to changes in streamflow levels in Porcupine Creek. The valley deposits along Corder Creek and Mike Draw consist primarily of a layer of Quaternary sheet wash and colluvium that is a mixture of poorly sorted clayey sands and sandy clays with occasional rock fragments underlain by a layer of fine grained alluvium consisting of fine sands with clay and silt interbeds.

North Prong and Little Thunder Creek within and adjacent to the Jacobs Ranch and Black Thunder permit areas have also been investigated for the presence of AVF's. A report of these investigations is contained in the Black Thunder Mine permit document (TBCC 1992). Thunder Basin Coal Company investigated the potential for the presence of AVF's along the lower portions of Shipley and Mills Draws and North Prong Little Thunder Creek within and near the Thundercloud LBA Tract and along Little Thunder Creek within and near the Black Thunder Mine permit area. TBCC concluded, and WDEQ concurred, that some characteristics of an AVF may exist but there are no declared AVF's within and surrounding the permit area of Jacobs Ranch Mine. The conclusions included the finding that the lower reaches of Mills and Shipley Draws within the Thundercloud LBA Tract are not AVF's.

WDEQ/LQD has declared 143 acres along the lower reach of Little Thunder Creek and 194 acres along the lower reach of North Prong Little Thunder Creek as AVF's. The declared AVF along Little Thunder Creek extends from the eastern boundary of the Black Thunder Mine downstream to the confluence with North Prong Little Thunder Creek. The reach of the AVF along North

Prong Little Thunder Creek extends from the south edge of Highway 450 downstream to the confluence with Little Thunder Creek, which is several miles southeast of the Thundercloud LBA Tract (Figure 3-11). WDEQ/LQD declared the lower portions of the North Prong and Little Thunder Creek as AVF's due to the potential for subirrigated and flood irrigated agricultural activity on the alluvial deposits. Irrigation structures exist on lower North Prong but have not been used for many years. The declared AVF's will not be affected by the planned mining and reclamation within the Thundercloud LBA Tract since the tract is located several miles upstream from the declared AVF's.

KMCC is currently investigating the heretofore undeclared reaches of Mills and Shipley Draws within and upstream from the LBA tract for AVF characteristics. This investigation is a requirement for a mine permit.

3.8 Wetlands

Wetlands are defined as areas inundated or saturated with surface or groundwater 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 DFR 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 U.S. Army Corps of Engineers (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 will 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.

Jurisdictional wetland inventories were completed in 1996 by PRCC on the Powder River LBA Tract and adjacent areas which may be disturbed by mining activities. The wetlands delineation was completed in accordance with the procedures and criteria contained in the COE 1987 Wetlands Delineation Manual. A total of approximately 15 acres of jurisdictional wetlands were delineated within the area to be affected. Identified jurisdictional wetlands include playas (0.7 acre), manmade stockponds (4.3 acres), portions of ephemeral stream channels (9.9 acres), and roadside ditches/borrow pits (<0.1 acre). The jurisdictional wetlands also qualify as waters of the United States. An additional 5.4 acres of waters of the United States which did not qualify as jurisdictional wetlands were also identified. These waters included playas (<0.1 acre), stockponds (0.5 acre), ephemeral stream channels (4.3 acres), and roadside borrow pits (0.6 acre). These sites did not possess wetland characteristics because they pond or contain water for insufficient periods of time. PRCC has submitted a jurisdictional delineation of wetlands and other waters of the U.S. to the COE for the Powder River LBA Tract;

however, COE verification of PRCC's delineation has not been completed.

Jurisdictional wetland inventories were conducted by KMCC on the Thundercloud LBA Tract and adjacent areas which may be disturbed by mining activities in 1994, 1995, and 1996. The wetlands delineation was completed in accordance with the procedures and criteria contained in the COE 1987 Wetland Delineation Manual. KMCC submitted a jurisdictional delineation of wetlands and other waters of the U.S. on the Thundercloud LBA Tract to the COE on July 10, 1997. The COE conducted a site visit on September 8 and 9, 1997. Based upon the information submitted and the site visit, a total of 104.5 acres of waters of the U.S. have been identified, of which 56.7 acres are jurisdictional wetlands. There is an additional 0.97 acre of non-jurisdictional wetlands also contained in the tract. Identified jurisdictional wetlands include playas (35.3 acres), manmade stockponds (8.4 acres), portions of ephemeral stream channels (10.2 acres) and roadside ditches and borrow pits (2.8 acres). The additional 47.8 acres of waters of the U.S. which did not qualify as jurisdictional wetlands include playas (39.8 acres), stockponds (1.8 acres), ephemeral stream channels (5.6 acres) and roadside borrow pits (0.6 acre). These sites did not possess wetland characteristics because they pond or contain water for insufficient periods of time.

3.9 Vegetation

Vegetation studies have been completed within and adjacent to both LBA tracts. The vegetation studies on the Thundercloud LBA Tract were completed in accordance with Appendix A of the WDEQ/LQD's Rules and Regulations. For the Powder River LBA Tract, preliminary vegetation studies were completed in 1996, and final studies in

3.0 Affected Environment

accordance with WDEQ/LQD Rules and Regulations are scheduled for completion in 1997. The study areas for these vegetation studies included the LBA tracts and a buffer area around each tract sufficient to mine and reclaim each tract as a part of the existing mine operation.

A total of ten vegetation types or map units were identified by the studies. Vegetation types for the Powder River and Thundercloud LBA Tracts, as well as the total area that would be disturbed while mining tracts as an extension of the existing mining operation, is provided in Tables 3-6 and 3-7, respectively. The vegetation map units are described below.

The **big sagebrush type** was the largest map unit identified on the Thundercloud LBA Tract and occurs on uplands scattered throughout the study area. As the name implies, this area is a shrubland dominated by big sagebrush (*Artemisia tridentata*). Major perennial grass species found in this map unit were western wheatgrass (*Agropyron smithii*), prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*), and needle-and-thread (*Stipa comata*). Annual grasses were also abundant in this vegetation type and were dominated by cheatgrass brome (*Bromus tectorum*).

The **upland grassland** type was the largest map unit identified on the Powder River LBA Tract and was found primarily on uplands scattered throughout the study area. This map unit was generally dominated by perennial grasses, but annual grasses and annual forbs were also common in 1996. The dominant perennial grasses were needle-and-thread, western wheatgrass and prairie junegrass. The dominant annual grass was six-weeks-grass (*Festuca octoflora*), which provided the most coverage of any single species on this map unit. Cheatgrass brome

was another abundant annual grass recorded for this type. Fluffweed (*Filago arvensis*) was the most common annual forb recorded.

The **cultivated** lands documented on the study area were comprised solely of crested wheatgrass (*Agropyron cristatum*) seedlings. In many cases, these seedlings had been completed so long ago that encroachment of native species has since occurred. However, areas tilled and seeded to crested wheatgrass were easily recognized during the growing season and were still dominated by this introduced species. This vegetation type exhibited far less vegetation cover and ground cover than the sagebrush shrubland type. The most common perennial grasses recorded on these areas were western wheatgrass and sandberg bluegrass.

The **breaks grassland** type was found on the central portion of the Powder River LBA Tract. This type occurred primarily on heavy clay soils with numerous slickspots and some salinity or alkalinity. Much of the soil within this vegetation type is unsuitable for salvage as topsoil. This vegetation type exhibited far less vegetation cover and ground cover than the sagebrush shrubland type. The most common perennial grasses recorded on these areas were western wheatgrass and sandberg bluegrass.

The **mixed shrub** type was found on the western portion of the Thundercloud study area. This type occurred primarily on heavy clay soils with numerous slick spots and some salinity or alkalinity. Much of the soil within this vegetation type was deemed unsuitable for salvage as topsoil. Big sagebrush was the dominant shrub on this type but greasewood (*Sarcobatus vermiculatus*) was also common.

The **reclaimed lands** were found mostly in the southeastern corner of the Thundercloud

Table 3-6. Acreage Tabulations for Vegetation Types Identified Within the Powder River LBA Tract and the Total Disturbance Area

Vegetation Type	Powder River LBA Tract		Total Disturbance	
	Acres	Percent of Area	Acres	Percent of Area
Big Sagebrush Grassland	927	23	1,671	33
Upland Grassland	1,338	33	947	29
Cultivated	444	11	144	7
Breaks Grassland	1,056	26	808	24
Disturbed Lands	33	<1	100	2
Reservoirs/ Stockponds	8	<1	3	<1
Bottomland Grassland	151	4	219	5
Playa Grassland	64	2	14	<1
Totals	4,021	100	3,906	100

Table 3-7. Acreage Tabulations for Vegetation Types Identified Within the Thundercloud LBA Tract and the Total Disturbance Area

Vegetation Type	Thundercloud LBA Tract		Total Disturbance	
	Acres	Percent of Area	Acres	Percent of Area
Big Sagebrush	1,373	40	1,522	38
Upland Grassland	968	28	1,173	29
Cultivated	452	13	508	12
Mixed Shrub	394	11	484	12
Reclaimed Lands	78	2	155	7
Disturbed Lands	98	3	113	3
Reservoirs/Stockpond	40	1	48	1
Bottomland Grassland	22	1	24	1
Povertyweed and Saltgrass Playas	11	<1	18	<1
Total	3,436	100	4,045	100

3.0 Affected Environment

study area. These sites were reclaimed by the Black Thunder Mine following coal removal in those areas. Vegetation cover and production are generally good. Wheatgrasses dominate the vegetation but some big sagebrush and fourwing saltbush (*Atriplex canescens*) plants are also present.

The **disturbed lands** are located throughout the study area. These sites include oil and gas wells, roads, a pumping station, a plant, pipelines, a railroad and a highway. Most of the disturbed areas are devoid of vegetation or are dominated by weeds.

There are a variety of **reservoirs/stockponds** scattered throughout the study area. Most of these ponds are relatively small and do not contain water throughout the year. Many of the ponds only contain water for a short period of time during the spring or immediately following intense thunderstorms that produce runoff. Many areas are devoid of vegetation following evaporation of the impounded water. Species in this vegetation type are highly diverse. Species typically found in these areas range from wetland species such as longstem spikerush (*Eleocharis palustris*) and bulrush (*Scirpus spp.*) to bottomland grassland species such as Kentucky bluegrass (*Poa pratensis*), foxtail barley (*Hordeum jubatum*), inland saltgrass (*Distichlis stricta*), alkali bluegrass (*Poa juncifolia*) and alkaligrass (*Puccinellia nuttalliana*). All ponds were evaluated as potential wetlands. The results of these evaluations are discussed in Section 3.8.

The **bottomland grassland** type is primarily located along ephemeral drainages and includes the shorelines of stockponds located in the drainages. Predominant species were perennial grasses and included western wheatgrass, Kentucky bluegrass and foxtail barley. The annual grass, Japanese brome

(*Bromus japonicus*), was also abundant in this vegetation type.

One **povertyweed playa** and one **saltgrass playa** were identified in the western portion of the Thundercloud study area. The povertyweed playa was dominated by povertyweed (*Iva axillaris*), a noxious weed, and the annual forb scouler popcorn flower (*Plagiobothrys scouleri*). The saltgrass playa occupied was dominated by inland saltgrass. Vegetation was very sparse on both areas. The **playa grassland** is located within several small playas on the Powder River LBA Tract and adjacent area. The primary grass component of this vegetation type is western wheatgrass. Much of the soil is unsuitable due to high salt content.

Threatened, Endangered, and Candidate Plant Species

The Endangered Species Act (16 U.S.C. 1531-1543) protects plant and animal species that are listed as threatened and endangered (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. 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 proposed rules have not yet been issued.

A list of T&E and candidate species potentially occurring in the Powder River and Thundercloud tracts was provided by USFWS (USFWS, written communication, 10/17/96). No T&E or candidate plant species were included on this list as

potentially being present on the Powder River LBA Tract or the Thundercloud LBA Tract. Surveys for T&E plant species within the Powder River LBA Tract and adjacent areas were conducted in 1997. Surveys for T&E plant species were conducted for the Thundercloud LBA Tract and adjacent areas in 1995 and 1996.

Of special concern was the Ute Lady's Tresses orchid (*Spiranthes diluvialis*) which is listed as a threatened plant species. The species was collected along the upper reaches of Antelope Creek in the southwestern part of the PRB during 1994. Surveys completed for the LBA tracts did not locate this species or any other T&E species on either of the LBA tracts or areas adjacent. Discussions with personnel of the Rocky Mountain Herbarium in Laramie, Wyoming indicate habitat for the Ute Lady's Tresses orchid probably did not occur on the study area due to the lack of perennial or intermittent streams with shorelines that are subirrigated throughout the summer.

The 1995 plant surveys of the Thundercloud LBA Tract did result in the collection of one plant species which had never before been collected in Wyoming and was therefore a new state record. The species, *Sesuvium verrucosum*, was verified by personnel from the Rocky Mountain Herbarium. The plant was collected from an alkali playa located north of the Thundercloud LBA Tract. Other plant species or habitats of special concern due to rarity were not identified on the study area.

3.10 Wildlife

Wildlife surveys have been completed within and adjacent to both LBA tracts. Because wildlife habitat and characteristics are site dependent, the wildlife discussions for each LBA tract are presented separately.

Powder River LBA Tract

PRCC has conducted wildlife baseline investigations on the Powder River LBA Tract. The objectives of the project were to collect both qualitative and quantitative data on vertebrate occurrence, abundance, and habitat affinity on the Powder River LBA Tract and surrounding area as a prerequisite to applying for a mining permit.

Baseline studies were completed in 1994 (Powder River Eagle Studies 1996). That year, systematic surveys were conducted for big game, upland game birds, waterfowl and shorebirds, raptors, migratory birds of high federal impact (MBHFI), breeding birds, and lagomorphs. Although specific surveys were not conducted for T&E species, observers watched for those animals and their requisite habitats. Incidental observations were also made of predators, amphibians, and reptiles. The extent of habitats on the Powder River LBA Tract was also mapped. In 1995 and 1996, PRCC conducted monitoring studies at Rochelle and North Antelope Mines. Those studies yielded additional information on wintering big game, nesting raptors, and upland game birds in the vicinity of the Powder River LBA Tract.

Small mammals were not trapped on the Powder River LBA Tract because previous surveys conducted at the adjacent North Antelope (North Antelope Coal Company 1994) and Rochelle Mines (Rochelle Coal Company 1994) demonstrated that no unique or unusual species occurred in the general area.

While wildlife inventory efforts focused on the Powder River LBA Tract, some surveys extended onto adjacent land. The baseline area and a half-mile perimeter were searched for MBHFI. Searches for upland game bird leks extended into a one-mile perimeter

around the baseline area. The survey area for big game and raptors included the Powder River LBA Tract and its two-mile perimeter.

Fish

Due to the intermittent to ephemeral nature of the drainages present within the Powder River LBA Tract and adjacent areas, habitat to support a fishery is minimal. It is possible that some fish species such as flathead minnow (*Pimephales promelas*) and black bullheads (*Amiurus melas*) may exist in some of the deeper pools on Porcupine Creek, but the tendency of these pools to go dry during drought periods makes the presence of fish unlikely.

Big Game

The WGFDD has classified the entire Powder River LBA Tract as pronghorn (*Antilocapra americana*) yearlong range. A small area in the north-central part of the two-mile perimeter was classified as winter/yearlong range. Pronghorn were commonly observed in the vicinity of the Powder River LBA Tract and were present year-round in moderate numbers.

In 1994, the number of pronghorn observed on the baseline area and in the two-mile perimeter varied considerably during the three aerial surveys. The largest number observed over the entire area was 596 (7 per mi²) during the March survey.

After March, the number of pronghorn in the area decreased considerably. The reduction in pronghorn abundance after winter may reflect some dispersion from the area. However, it is also likely that more pronghorn were overlooked during the June survey. Large winter herds broke up after March and were less obvious. In March,

herds of up to 48 animals were seen; herd size did not exceed 13 animals during the June survey.

By late summer, the number of pronghorn in the area had increased. Fawns, which were small and may have been missed during the June survey, undoubtedly augmented the population. Although pronghorn abundance increased through the summer, the number of pronghorn seen on September 18th was less than half the number recorded in March. During the March and June surveys, pronghorn density was slightly greater on the Powder River LBA Tract than in the two-mile perimeter; densities were very similar during the September survey.

Pronghorn were distributed throughout the Powder River LBA Tract and its two-mile perimeter during all three surveys. However, more pronghorn were observed in the western half of the area, and especially the northwest corner, during each survey. Terrain in those portions of the 79 mi² area is not as rugged as in other sections. Pronghorn seemed to be nearly absent from the extreme north-central section of the survey area during each flight. The habitat in that portion of the area appeared suitable, so the low counts in north-central segment were considered coincidental.

Habitat utilization noted during the aerial surveys was typical of pronghorn in northeast Wyoming. Pronghorn were observed in big sagebrush grassland, upland grassland, breaks grassland, reclaimed grassland, and bottomland grassland during each of the surveys. During the March survey, most of the pronghorn seen (77%) were in big sagebrush grassland. This result is not surprising because big sagebrush grassland is the most abundant type in Powder River LBA Tract disturbance area, and sagebrush grassland is preferred by wintering

pronghorn (Sundstrom et al. 1973). Pronghorn were much less concentrated in big sagebrush grassland during the early and late summer surveys. More pronghorn were seen in upland grassland areas than any other habitat during the June survey.

The number of pronghorn observed during the 1994 driving survey (106) was similar to the number observed during the June aerial survey (139). Approximately 50% of the pronghorn observed during the driving survey were in big sagebrush grassland. The rest were divided evenly between upland and meadow grasslands.

Sex and age data indicated that the percentage of adult and yearling bucks in the area was approximately 36% of all animals classified during the survey. The ratio of fawns per 100 does observed during the ground survey was 103:100. That was greater than the ratio of 85 fawns per 100 does recorded by WGFD (Wilson 1994) for the entire northeast region of Wyoming in 1994.

Densities recorded during winter aerial surveys conducted from 1994 through 1996 indicated that the pronghorn population in the Powder River LBA Tract and two-mile perimeter decreased considerably by March 1996. It is likely that losses to hemorrhagic disease in autumn 1995 reduced the density of pronghorn wintering in the area in the winter of 1995-1996. WGFD personnel estimated that the disease outbreak reduced pronghorn populations throughout the region by 15-25%; in some areas, losses were estimated to be nearly 60% (Gillette News-Record 1996a).

WGFD has classified approximately 60% of the Powder River LBA Tract as mule deer (*Odocoileus hemionus*) "out" range. The habitat in such areas is considered to be

inadequate to support mule deer. The area of mule deer yearlong range has been delineated along Porcupine and Corder Creeks.

Because habitat is limited, few mule deer would be expected to occur in the area. The number of deer recorded in the 79 mi² aerial survey area in 1994 ranged from 34 in March to four in June. Deer recorded during aerial surveys were often seen in the breaks grasslands located in the eastern and south-southeastern portions of the survey area. The number of deer observed in the Powder River LBA Tract and two-mile perimeter during winter aerial surveys completed from 1994-1996 ranged from 15 to 34. Variations in the number of mule deer observed during the flights may not be important. The aerial surveys, as conducted, are designed primarily to census pronghorn and may not yield accurate counts of deer.

Driving surveys completed in 1994 indicated that deer were scarce in the baseline area. The greatest number of deer seen was 33 on June 23rd. Big sagebrush grassland was the only habitat in which deer were observed during all surveys. Meadow grassland habitat was the only other habitat in which deer were recorded more than once.

Although the Powder River LBA Tract is within the WGFD Elk (*Cervus elaphus*) Hunt Area 113, which contains the Rochelle Hills Elk Herd, the LBA tract itself is classified as elk "out" range. Elk sightings within the LBA tract are rare to non-existent.

Upland Game Birds

The sage grouse (*Centrocercus urophasianus*) is the only upland game bird that occurs in the vicinity of the Powder River LBA Tract. One known sage grouse lek, "Wilson", is located within 0.5 mile of the eastern boundary of the Powder River LBA Tract, in

3.0 Affected Environment

NW1/4 NE1/4 Section 36, T42N, R70W (see Figure 3-12). Wilson lek was discovered by WGFD personnel in spring 1975; WGFD also monitored the lek in 1979 and 1980. Because Wilson lek is on the Rochelle Mine permit area, it has been monitored each spring since mine construction began in 1985.

During the springs of 1979 and 1980, 30 to 35 males were regularly seen at the lek. The next year the lek was checked, 1985, substantially fewer males were attending Wilson. The decrease in attendance was probably caused by two weather factors that reduced sage grouse populations throughout the PRB in 1984. The winter of 1983-1984 was very severe and resulted in the loss of breeding birds from the population; a blizzard in April 1984 largely eliminated reproduction that spring.

Sage grouse populations remained low through 1988. By the 1989 breeding season, however, grouse attendance at Wilson and other leks in the region was starting to increase (PRES 1997). From 1989 through 1991, attendance at Wilson lek was similar to that observed in 1979 and 1980. After 1991, attendance at Wilson steadily declined. By 1996, male attendance at the lek dropped to its lowest level ever.

Natural factors have probably caused the most recent decline in attendance at Wilson lek. Drought conditions severely limited brood rearing habitat during the late 1980's and early 1990's. Without good brood rearing areas, chick survival is reduced and the population declines. No land use changes occurred within 1.5 miles of the lek from 1979 through 1996.

No new leks were found on the Powder River LBA Tract or within its one-mile

perimeter during searches completed in spring 1994.

Meadow grasslands (bottomlands) on the Powder River LBA Tract appear to be suitable sage grouse summering and brood-rearing habitat. However, observations indicated that few grouse used the area in summer 1994. No broods were seen along the three transects surveyed in July. A single adult female was seen on the southwest-most transect on July 21st. A female and brood of three young were incidentally observed near a pond at an old oil well site in SW1/4 SW1/4 Section 28, T42N, R70W, on July 14th.

Because sage grouse droppings generally persist with little deterioration for up to a year, scat noted during the initial June 4th survey were indicative of use during the previous year; results from the August 11th survey reflected summer use. Only two old droppings were found during the early summer survey; one scat was found in meadow grassland and one was found in big sagebrush grassland. No scats were found when the transects were surveyed in August 1994. Although the big sagebrush grasslands on and near the Powder River LBA Tract seem sufficiently dense to serve as wintering or nesting habitat, apparently few grouse have used the area in recent years.

Waterfowl and Shorebirds

Little standing water was present in ponds or in Porcupine Creek on the Powder River LBA Tract during the June 23rd and July 14th surveys. Of the 14 ponds, three were completely dry during both surveys and eight held little water through summer 1994; only three ponds were more than half full during a survey. Water in Porcupine Creek was limited to several scattered pools separated

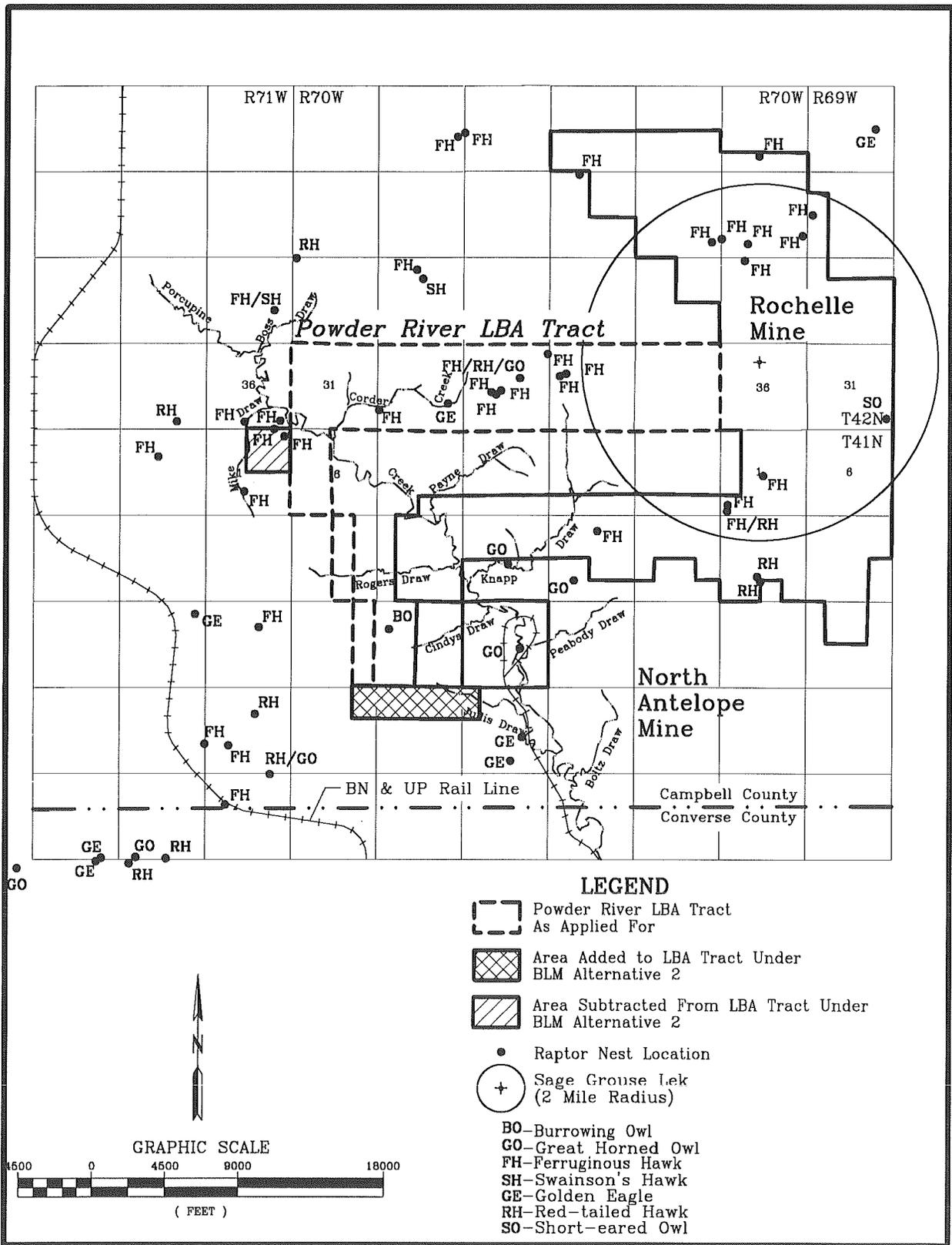


Figure 3-12. Raptor Nest Sites and Sage Grouse Leks Within and Adjacent to the Powder River LBA Tract.

by dry sections. No flowing water was observed in the creek in summer.

Five species of dabbling ducks and one shorebird were seen in the Powder River LBA Tract. Most of the birds seen during the surveys were along Porcupine Creek and a stock pond located in NW1/4 NW1/4 Section 34, T42N, R70W. Water levels in the creek and ponds diminished after June, and substantially fewer birds were observed in July than in June.

The American wigeon (*Anas americana*) was the most common duck recorded in June; mallards (*Anas platyrhynchos*) were the most common species during the July 14th survey. The killdeer (*Charadrius vociferus*) was the only shorebird seen during surveys. Just one brood of five mallards was seen during the July 14th survey; no young killdeer were identified, but it is likely that killdeer bred on the Powder River LBA Tract.

The scarcity of waterfowl and shorebirds on the Powder River LBA Tract is not surprising. Waterfowl habitat in northeast Wyoming in general, and the Powder River LBA Tract in particular, is very limited and largely ephemeral. Typically, most of the migrants that visit the region in the spring move elsewhere to breed.

Raptors

Over the years, 98 nests have been located in the entire 79 mi² area. After their discovery, some of those nests were destroyed by natural forces; others were removed as mitigation measures. Consequently, as of August 31, 1996 there were 57 known intact raptor nests in the area (Figure 3-12); 16 nests were on the Powder River LBA Tract and 41 were in the 2-mile perimeter. The 57 intact nests included:

- 31 ferruginous hawk nests,
- 7 golden eagle nests,
- 6 red-tailed hawk nests,
- 5 great horned owl nests,
- 1 Swainson's hawk nest,
- 1 burrowing owl nest hole,
- 1 short-eared owl nest,
- 2 nests that have been used by red-tailed hawks and by great horned owls,
- 1 nest that has been used by ferruginous hawks and Swainson's hawks,
- 1 nest that has been used by ferruginous hawks and red-tailed hawks, and
- 1 nest that has been used by ferruginous hawks, red-tailed hawks, and great horned owls.

Four species of raptors nested in the area each year from 1992 through 1996: golden eagles (*Aquila chrysaetos*), ferruginous hawks (*Buteo regalis*), red-tailed hawks (*Buteo jamaicensis*), and great horned owls (*Bubo virginianus*). Swainson's hawks (*Buteo swainsoni*) nested during four of those years. Burrowing owls (*Athene cunicularia*) have historically nested within the area, but none were observed from 1992-1996. Short-eared owls (*Asio flammeus*) were found nesting in the area for the first time in 1996. Northern harriers (*Circus cyaneus*), prairie falcons (*Falco mexicanus*), and turkey vultures (*Cathartes aura*) have been observed in the area during most breeding seasons, but no nests containing eggs or young of those species were found. Northern harriers could nest in the area, but the lack of cliff habitat on the Powder River LBA Tract would probably preclude nesting by prairie falcons and turkey vultures.

Ferruginous hawk nests were by far the most abundant nests in the area. Thirty-one intact ferruginous hawk ground nests existed at the

end of 1996; 13 on the Powder River LBA Tract and 18 in the two-mile perimeter. Three other nests have been used by ferruginous hawks and other species over the years. The abundance of ferruginous hawk nests in the area is undoubtedly due to this species' habit of building multiple nests within individual territories. Based on the spacing of nests and monitoring data, it appeared that the 31 intact ferruginous hawk nests were in fourteen different territories. Each year since 1992, at least three pairs of ferruginous hawks attempted to nest in the area. Reproduction was highest in 1992, when nine young fledged. Since then, annual production has been considerably reduced.

There were seven golden eagle nests, presumably in five territories, in the survey area in August 1996. One of those nests (GE1e) was on the Powder River LBA Tract and six were within the two-mile perimeter. Nest GE1e is a nesting platform that was erected in 1993 by PRCC to mitigate potential impacts to eagles nesting at the North Antelope Mine. Three or four pairs have nested in the survey area each year from 1992 through 1996. After a peak of three young fledged in 1992, annual production was only one young per year from 1993 through 1995. Two young fledged in 1996. At the end of 1996 there were six red-tailed hawk nests in the area; there were four other intact nests that had been used alternately by red-tailed hawks and other raptors. Two of the nests that have been used by red-tailed hawks are on the Powder River LBA Tract. From 1992 through 1996, red-tailed hawks nested in seven different territories in the entire survey area. The highest number of nesting pairs observed was five in both 1992 and 1996; one to three pairs nested each year from 1993-1995. Productivity was highest in 1992 when eight young fledged. Productivity fell to none or one young during

each of the next three years. In 1996, productivity increased to five fledglings.

At the end of the 1996 breeding season, there were eight intact nests in the survey area that had been used at least once by owls. Only one of the nests used by owls was on the Powder River LBA Tract; the remaining sites were in the two-mile perimeter. As with other species, great horned owl nesting success was highest in 1992. The number of nesting pairs was greatly reduced in 1993, and remained low in subsequent years.

Each year since 1992, there have been one or two intact Swainson's hawk nests in the two-mile perimeter. A third nest on the Powder River LBA Tract was used by Swainson's in the past but has been used by ferruginous hawks since 1993. During most years, only one pair of Swainson's hawks was found nesting in the area; two pair nested in 1994.

Monitoring data indicate that there was a considerable decline in raptor breeding productivity after 1992. All species experienced decreased productivity, but the decline was especially evident for ferruginous hawks, red-tailed hawks, and great horned owls. Reduced production in recent years was undoubtedly the result of a decline in prey (lagomorph) abundance. Surveys at mines throughout the PRB have demonstrated that lagomorph populations declined dramatically after winter 1992-1993 and remained relatively.

Migratory Birds of High Federal Interest

Table 3-8 lists the 17 MBHFI of concern in the PRB and their expected occurrence in the Powder River LBA Tract. Historically, 12 of the 17 MBHFI have been recorded in the area. Seven of the observed MBHFI are raptors.

3.0 Affected Environment

Table 3-8. MBHFI Status Northeast Wyoming and Expected Occurrence on or near the Powder River LBA Tract

Species	Seasonal Status/ Breeding Records in NE Wyoming ¹	Sighting Records in Vicinity of Powder River LBA Tract	Expected Occurrence in Vicinity of Powder River LBA Tract
White Pelican	Summer/nonbreeder	Yes	Rare
Double-crested Cormorant	Summer/breeder	Yes	Rare
Canvasback	Summer/one record	No	Rare
Osprey	Summer/nonbreeder	Yes	Rare
Bald Eagle	Winter/nonbreeder	Yes	Common in Winter
Ferruginous Hawk	Summer/breeder	Yes	Common
Golden Eagle	Resident/breeder	Yes	Common
Richardson's Merlin	Resident/breeder	Yes	Rare
Peregrine Falcon	Migrant/historical breeding record only	No	Rare
Prairie Falcon	Resident/breeder	Yes	Uncommon
Sandhill Crane	Migrant/nonbreeder	Yes	Uncommon
Whooping Crane	Never recorded	No	Very Rare
Mountain Plover	Summer/breeder	Yes	Uncommon
Long-billed Curlew	Summer/breeder	Yes	Rare
Burrowing Owl	Summer/breeder	Yes	Uncommon
Lewis' Woodpecker	Summer/breeder	No	Rare
Dickcissel	Summer/breeder	No	Rare

¹ Compiled from Oakleaf et al. (1992), includes Campbell County and adjacent counties.

Only three MBHFI--the ferruginous hawk, golden eagle, and burrowing owl--have ever been found breeding on the Powder River LBA Tract or its half-mile perimeter. Ferruginous hawk and golden eagle nesting on the Powder River LBA Tract were discussed above. Burrowing owls were found nesting in a black-tailed prairie dog (*Cynomys ludovicianus*) colony in the half-mile perimeter in 1985, but not in subsequent years. Non-breeding MBHFI raptors that

have been recorded on or near the Powder River LBA Tract include bald eagles (*Haliaeetus leucocephalus*), prairie falcons, Richardson's merlins (*Falco columbarius richardsonii*), and osprey (*Pandion haliaetus*). Bald eagles occur only as winter visitors in northeast Wyoming. Although they were seen flying over the Powder River LBA Tract each winter, there were no roost sites or unique prey sources that attracted bald eagles to the area.

There is no nesting habitat for prairie falcons or merlins on the Powder River LBA Tract. Both of those species, however, have nested in the vicinity of the adjacent Rochelle Mine.

Non-raptor MBHFI that have been recorded in the vicinity of the Powder River LBA Tract include American white pelicans (*Pelecanus erythrorhynchos*), double-crested cormorants (*Phalacrocorax auritus*), sandhill cranes (*Grus canadensis*), long-billed curlews (*Numenius americanus*), and mountain plovers (*Charadrius montanus*). White pelicans and double-crested cormorants sporadically frequent Porcupine Reservoir, which is approximately 2.5 miles southeast of the Powder River LBA Tract. Although it has a large capacity and holds water in spring, Porcupine Reservoir usually is dry or mostly empty by July. Consequently, it is extremely doubtful that pelicans or cormorants would ever breed at the reservoir.

Sandhill cranes commonly migrate over Campbell County in spring and fall; however, this region does not lie within the major migration routes shown by Evans and others (1983). Migrating cranes frequent wet meadows, grainfields, and alfalfa fields. Such areas do not occur on the Powder River LBA Tract. The only long-billed curlews reported in the area were probably migrants passing through the region. Curlews were seen during monitoring studies at the nearby Rochelle Mine in 1994 and 1996.

Mountain plovers have regularly nested at the nearby Antelope Mine, but few have been sighted in the Powder River LBA Tract survey area. Only one observation of a lone plover was seen near a playa in the southeast part of the half-mile perimeter in 1988. Each year from 1994 through 1996, adult plovers were seen in a black-tailed prairie dog colony in the half-mile perimeter in SE1/4 NW1/4 Section 17, T41N, R70W. All of those

sightings were made in spring. Numerous searches of the colony and surrounding area have failed to locate any plover nests and no young have ever been seen.

Breeding Birds

Twenty-eight species were seen during breeding bird surveys completed in 1994. Species richness was greatest in bottomland grassland, where 21 species were observed, more than twice as many as were observed in any other habitat. Ten species were observed in upland grassland and nine in big sagebrush grassland. Cultivated land (seeded grassland) and tree windbreak had the fewest species; eight species were found in each of those habitats.

Twenty-three of the 28 species recorded were classified as regular (observed three or more times over the four survey mornings) in at least one habitat. The remaining five species were considered to be occasional (observed fewer than three mornings). The western meadowlark (*Sturnella neglecta*) was the only species observed in all five habitats and it was a regular species in each. Lark buntings (*Calamospiza melanocorys*), horned larks (*Eremophila alpestris*), vesper sparrows (*Pooecetes gramineus*), grasshopper sparrows (*Ammodramus savannarum*), and mourning doves (*Zenaidura macroura*) were observed in four of the five habitats surveyed. Lark buntings, horned larks, vesper sparrows, and grasshopper sparrows were not observed in the tree windbreak; mourning doves were absent from upland grasslands. In addition to being wide-spread, lark buntings and horned larks were abundant and regular in all four habitats where they occurred. Vesper sparrows and grasshopper sparrows were regularly found in two habitats and were occasional in two others. Mourning doves were regular in the tree windbreak, but were occasional in the other three habitats where

3.0 Affected Environment

they occurred. Fourteen species recorded in 1994 were seen in only one habitat.

Avian abundance (mean number of birds observed per day per transect/plot) was very similar among all habitats except tree windbreak. Abundance was greatest in meadow grassland (35.8 birds/day), followed by big sagebrush grassland (34.4 birds/day), upland grassland (33.0 birds/day), and seeded grassland (31.1 birds/day). The value for meadow grassland transects was inflated because a flock of 71 starlings (*Sturnus vulgaris*) was observed in the transect during one survey period (abundance was 26.5 birds/day when the starlings were omitted from the calculations). Slightly more than 8.0 birds/day were seen in the tree windbreak. That result, however, was undoubtedly influenced by the small size of the tree plot.

Lagomorphs

Lagomorph surveys completed on September 9-10, 1994 confirmed that hare and rabbit populations in the Powder River LBA Tract were very depressed. No rabbits were seen during the two nights of spotlighting (23.2 miles total). Surveys completed at coal mines in the PRB in 1993 demonstrated that lagomorph abundance was very low throughout the region that year (PRES 1996). Results from surveys conducted at area mines in 1995 and 1996 indicated that the population was slowly beginning to recover (PRES 1996). Reduced numbers since 1993 probably reflect a natural low in the lagomorph population cycle.

Predators and Furbearers

No formal surveys for predators or furbearers were conducted, but personnel watched for them during all field studies. The Powder River LBA Tract and

surrounding area are primarily used for sheep grazing. Because sheep are particularly vulnerable to predation, local ranchers continually attempt to control predators in the area. Consequently, few predators were observed during 1994; only one coyote was seen during field studies that year. Red foxes (*Vulpes vulpes*) were occasionally observed throughout the year on the Powder River LBA Tract and in the perimeter. On September 10th, four foxes were seen on the Powder River LBA Tract by personnel spotlighting for lagomorphs. Also seen on September 10th was a family group of four young raccoons (*Procyon lotor*) along Porcupine Creek in the northwest corner of the Powder River LBA Tract. A muskrat (*Ondatra zibethicus*) was recorded on a pond on the Powder River LBA Tract on April 14th. Other species seen in 1994 included striped skunks (*Mephitis mephitis*) and feral cats (*Felis domesticus*).

Other

Other species seen during each of the aerial surveys included mule deer and golden eagles. One bald eagle was seen during the March survey; two red-tailed hawks were recorded in June; and one coyote (*Canis latrans*) was noted in September. A total of three dead pronghorn were observed during the March and June surveys.

Thundercloud LBA Tract

Detailed wildlife surveys for the purpose of obtaining a WDEQ/LQD mining permit for the Thundercloud LBA Tract were completed during 1995 and 1996. The entire Thundercloud LBA Tract was also surveyed during baseline studies for the adjacent Jacobs Ranch Mine (JRM) permit and/or Black Thunder Mine (BTM) permit. Additionally, the Thundercloud LBA Tract is covered under portions of the wildlife

monitoring programs for both mines. The result is over 15 years of wildlife surveys that have covered all, or portions of, this area.

Fish

Although several ponds and ephemeral drainages exist within the Thundercloud LBA Tract and adjacent areas, habitat to support a fishery is not present. The ponds and drainages generally do not hold water throughout the year or only do so as the result of an extremely wet year. Only one pond, a manmade stockpond located in NW1/4 Section 4, T43N, R70W, has been observed to consistently hold water over the past 10 years. However, water levels in this pond are so low in the fall that fish would not be able to survive or over-winter.

Big Game

Three big game species have been observed on the Thundercloud LBA Tract. These species include pronghorn, mule deer and elk. The white-tailed deer (*Odocoileus virginianus*) is found in limited numbers in portions of the PRB but has not been recorded on or adjacent to the Thundercloud LBA Tract. WGFD big game herd unit maps show this area is out of the normal white-tailed deer range.

The pronghorn is the most abundant big game animal in the region. The Thundercloud LBA Tract is within the WGFD Hilight Pronghorn Herd Unit with approximately 2,695 acres of the proposed disturbance within winter-yearlong range and the remaining 1,350 acres within yearlong range. None of the disturbance or areas within two miles have been classified as crucial or critical pronghorn habitat. Data obtained for the Hilight Herd Unit indicate the WGFD estimated population numbers

averaged approximately 17 animals per mi² of occupied habitat from 1980 through 1995. The yearly big game monitoring surveys completed for the adjacent JRM and BTM mines also covered the Thundercloud LBA Tract. The JRM surveys averaged 11 pronghorn per mi² and the BTM surveys averaged eight per mi² for the same period of 1980 through 1995. This would indicate that pronghorn numbers are much lower in this portion of the herd unit.

The Thundercloud LBA Tract and disturbance area are located within the western portion of the WGFD Thunder Basin Mule Deer Herd Unit. The WGFD maps show the proposed disturbance area includes 2,225 acres of yearlong mule deer range and 1,820 acres of lands which are generally out of normal use areas. Crucial or critical mule deer ranges do not occur on or within several miles of the proposed disturbance area. WGFD data from 1980 through 1995 for the entire herd unit show an average of four mule deer per mi² of occupied habitat while data collected by JRM and BTM averaged less than one animal per mi² for the same time period. The low densities exhibited by the mines' monitoring data reflect the fact that a good portion of the LBA tract is classified by WGFD as not being within normal mule deer use areas.

The Thundercloud LBA Tract is not generally considered by WGFD to be an elk use area, but several elk have been recorded on the eastern portion of the Thundercloud LBA Tract over the past several years. Elk have been observed spending considerable time wintering on reclaimed areas and adjacent grasslands on the southeastern portion of the Thundercloud LBA Tract in recent years. Three mature bull elk were also observed during wildlife surveys on the Thundercloud LBA Tract in July of 1996. At that time, they frequented bottomland

grasslands and upland grasslands on the eastern portion of the site.

None of the disturbance or areas within two miles have been classified as crucial or critical elk habitat. The nearest crucial elk habitat is 2.5 miles to the east on JRM reclaimed area. The WGFD (Oedekoven 1994) has designated an approximately five mi² area on reclaimed and adjacent lands as crucial winter habitat for the Rochelle Hills elk herd.

Upland Game Birds

Several upland game bird species have been observed on the Thundercloud LBA Tract or adjacent areas, including sage grouse and migratory mourning doves (*Zenaida macroura*). Based on field observations, the mourning dove was the most common of the two species. This species only inhabits the area from late spring to early fall for breeding and reproduction.

The sage grouse is a yearlong resident but did not appear to frequent the Thundercloud LBA Tract. Sage grouse lek surveys completed in April and early May of 1995 and April of 1996 failed to locate any active sage grouse strutting grounds on or within two miles of the Thundercloud LBA Tract. Previous monitoring for the adjacent JRM identified several strutting grounds located approximately 2.5 miles northeast of the Thundercloud LBA Tract. Only one of those grouse strutting grounds, located at the edge of a playa in SW4 Section 22, T44N, R70W, was active in 1995 and 1996. Figure 3-13 shows the location of this active lek and a two-mile radius which research identified as the area in which most of the hens will nest. This particular strutting ground was active from 1993 through 1996 with the maximum number of males recorded at 24 in 1993. A maximum of 14 males was observed at this

lek in 1995 and also in 1996. Wildlife surveys and monitoring for BTM identified one lek more than three miles south of the Thundercloud LBA Tract but that lek was abandoned in 1994 (TBCC 1996). Over 15 years of wildlife monitoring for the adjacent JRM revealed that sage grouse in that area did not have a long term affinity for a certain strutting ground but used six different sites during that period. The change of sites did not appear to be mine related as some movements were actually closer to mining. The different sites used over the 15 year period include playas (three), reclaimed oil/gas well drill holes (two), and bottomland grassland (one).

Sage grouse brood surveys were conducted on the Thundercloud LBA Tract along ephemeral stream drainages in July of 1995 and 1996. These surveys covered approximately four miles each year. Adult sage grouse or broods were not observed during either survey. However, one brood of six young were observed during other surveys completed in the summer of 1995. Two biologists spent a total of 18 man-days in July 1996 conducting various surveys on the Thundercloud LBA Tract but failed to record any sage grouse. These surveys indicate sage grouse use of the area for reproduction and raising young is very low. Sage grouse also were rarely observed on this study area during surveys completed in previous seasons.

Raptors

Numerous raptor species have been observed on or adjacent to the Thundercloud LBA Tract. These species include the golden eagle, bald eagle, northern harrier, Swainson's hawk, red-tailed hawk, ferruginous hawk, rough-legged hawk (*Buteo lagopus*), prairie falcon, American kestrel (*Falco sparverius*), turkey vulture,

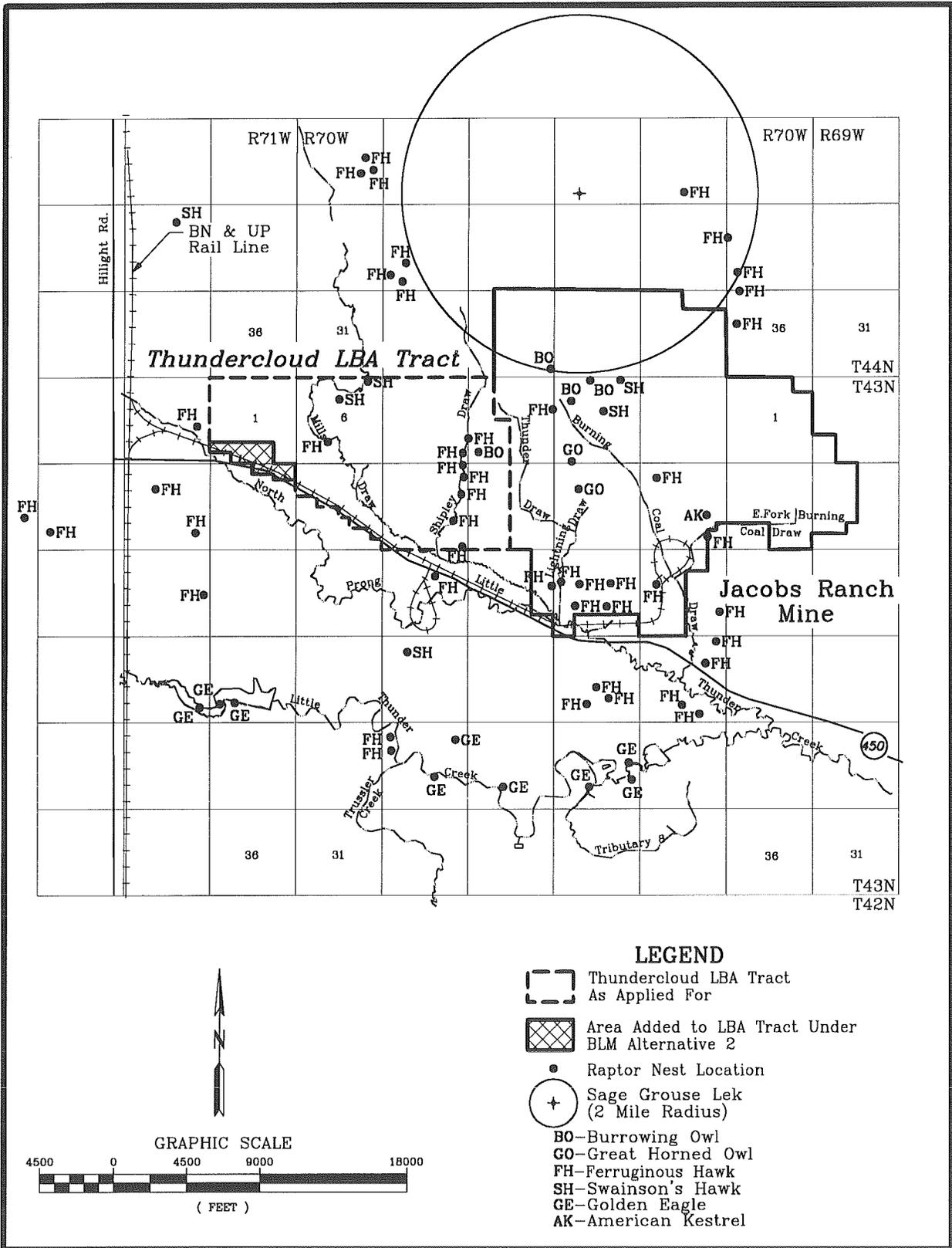


Figure 3-13. Raptor Nest Sites and Sage Grouse Leks Within and Adjacent to the Thundercloud LBA Tract.

3.0 Affected Environment

great horned owl, short-eared owl and burrowing owl. Although numerous raptor species have been observed in the area, very few nested on or near the site due to the lack of suitable nesting habitat (cliffs and tall trees). Figure 3-13 shows the locations of raptor nest sites that have been identified since monitoring began for the JRM which includes the Thundercloud LBA Tract and a 2.5-mile radius. The figure shows a total of 69 nest sites. As of 1996, 43 of those nest sites were still intact but only represented about 18 pairs of birds because many had alternate nest sites. Of the 26 nest sites that were no longer present, 15 were destroyed by natural events, eight were removed by mining activities and three were mitigation platforms that were moved. Eighteen of the intact nest sites were created by the mining companies to mitigate other sites impacted by mining. These sites consist of either platforms or nests placed on rock piles or on the ground for ferruginous hawks. A total of six raptor species have been identified nesting on or within 2.5 miles of the Thundercloud LBA Tract. These species include the burrowing owl, great horned owl, ferruginous hawk, Swainson's hawk, golden eagle and American kestrel. The ferruginous hawk was the most common species nesting in the area. In 1995, only six nest sites were active and included five ferruginous hawk nests and one Swainson's hawk nest.

Only three raptor species have been recorded nesting on the Thundercloud LBA Tract. The ferruginous hawk had the most nest sites, but all except one of those nest sites belonged to the same pair of birds. One of the ferruginous hawk nest sites was a platform erected by JRM to mitigate disturbed nests and enhance nesting success of an existing pair of birds. This pair had nested on the ground and generally failed to produce young due to predation. One pair of Swainson's hawks with two nest sites, one on

a power pole and the other in a small willow tree, have been successful nesting on the Thundercloud LBA Tract. A burrowing owl was recorded nesting on the Thundercloud LBA Tract in 1988 and 1989. That nest site was located in an old badger den. The burrowing owl has not been recorded nesting in adjacent areas since 1989.

The Thundercloud LBA Tract and lands within one mile do not contain trees large enough to support eagle nests. Cliffs also do not occur within the area, so falcon nesting habitat is not present.

Migratory Birds of High Federal Interest

Table 3-9 provides a list of the MBHFI species that may occur on the Thundercloud LBA Tract or disturbance areas. Nine MBHFI species have been documented in the area. The ferruginous hawk nests on the area, generally using ground nests. The burrowing owl was also recorded nesting on the area, but for only two years and has not been observed there since 1989. The golden eagle does not have nesting habitat on or within one mile of the Thundercloud LBA Tract but frequents the site in search of prey. The bald eagle is a common winter resident but would not nest in the area due to lack of suitable habitat. The other MBHFI species observed on the area were recorded as migrants or foraging in the area, and nesting habitat for those species does not occur on the site.

Other Species

Wildlife surveys completed specifically for the Thundercloud LBA Tract, and surveys completed for the adjacent mines, 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

Table 3-9. MBHFI Status in Northeast Wyoming and Expected Occurrence on or near the Thundercloud LBA Tract

Species	Seasonal Status/Breeding Records in NE Wyoming ²	Documented on or near Thundercloud LBA Tract	Expected in Thundercloud LBA Tract
White Pelican	Summer/nonbreeder	No	Rare
Double-crested Cormorant	Summer/breeder	No	Rare
Canvasback	Summer/one record	Yes	Rare
Ferruginous Hawk	Summer/breeder	Yes	Common
Bald Eagle ¹	Winter/nonbreeder	Yes	Common in winter
Golden Eagle	Resident/breeder	Yes	Common
Osprey	Summer/nonbreeder	No	Rare
Prairie Falcon	Resident/breeder	Yes	Uncommon
Peregrine Falcon	Migrant/historical breeding record only	Yes	Rare
Richardson's Merlin	Resident/breeder	Yes	Rare
Whooping Crane	Never recorded	No	Very rare
Sandhill Crane	Migrant/nonbreeder	No	Uncommon
Mountain Plover	Summer/breeder	No	Uncommon
Long-billed Curlew	Summer/breeder	Yes	Rare
Burrowing Owl	Summer/breeder	Yes	Uncommon
Lewis' Woodpecker	Summer/breeder	No	Rare
Dickcissel	Summer/breeder	No	Rare

¹ Although the bald eagle is generally considered a non-breeder in the PRB, a nesting attempt that failed was recorded by Black Thunder Mine.

² Compiled from Oakleaf et al. (1992). Includes Campbell County and adjacent counties.

observed included seven carnivores, 15 rodents, three lagomorphs, 35 waterbirds, 28 other bird species, and eight herptiles.

USFS Region 2 Sensitive Species

The USFS has identified certain sensitive species that they must consider in making land use decisions for lands they administer. Prior to mining, the LBA tracts will have to be evaluated for habitat for these species, and the USFS will have to make a determination

as to how mining could impact these species. A list of USFS Region 2 Sensitive Species that the LBA tracts will have to be evaluated for prior to mining is included as Appendix F.

Threatened, Endangered and Candidate Animal Species

The Endangered Species Act (16 U.S.C. 1531-1543) protects plant and animal species that are listed as threatened and endangered

3.0 Affected Environment

(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. 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 proposed rules have not yet been issued.

A list of T&E and candidate species potentially occurring in the Powder River and Thundercloud tracts was received from USFWS (USFWS, written communication, 10/17/96). T&E animal species potentially occurring on the LBA tracts are the black-footed ferret (endangered), bald eagle (threatened), and peregrine falcon (endangered). Two candidate species, mountain plover and swift fox, may potentially be present on the LBA tracts.

Powder River LBA Tract

The bald eagle has been observed in the area and was discussed previously. The bald eagle is a common winter resident and migrant and has been observed occasionally roosting in trees located in NW1/4 NW 1/4 Sec. 30, T42N, R70. The peregrine falcon has not been sighted in the vicinity of the Powder River LBA Tract, and would not be expected due to the absence of tall cliffs required for nesting habitat. Black-footed ferrets are found almost exclusively living in prairie dog towns. The prairie dog town nearest the Powder River LBA Tract is located in SW1/4 NW1/4 Sec. 17, T41N, R70W in the North Antelope Mine permit area. Because of the absence of habitat, and the fact that prior ferret searches in the nearby areas failed to provide any record of

their existence, ferrets would not be expected to occur in the Powder River LBA Tract. Mountain plovers have been sighted in the area of the Powder River LBA tract, but those sightings are uncommon, as indicated in the section on MBHFI. There have also been no observances of plover nests or young on the LBA tract.

Although red foxes have been observed on the Powder River LBA tract, there have been no sightings of swift foxes during the field studies on the Powder River LBA tract.

Thundercloud LBA Tract

The bald eagle and peregrine falcon have been observed on the area as discussed in previous sections. The bald eagle is a common winter resident and migrant and has been observed foraging on the area every winter. This species also has winter roost sites in the Rochelle Hills approximately six miles east of the Thundercloud LBA Tract. Bald eagle roosting and nesting habitat does not exist within two miles of the Thundercloud LBA Tract. The peregrine falcon was only observed on the area during migration. This falcon requires tall cliffs for nesting habitat, so it would not be expected to nest in this portion of the PRB due to the absence of that habitat feature. Black-footed ferrets are found almost exclusively living in prairie dog towns. Surveys indicate prairie dog towns are not located within the Thundercloud LBA Tract, and the nearest town observed was more than two miles away. Based on these facts, and the fact that prior ferret searches in the area failed to provide any record of their existence nearby, ferrets would not be expected to occur in the area.

As indicated in Table 3-9, mountain plovers have not been documented on or near the

Thundercloud tract. No sightings of swift foxes have been recorded on the area.

3.11 Ownership And Use of Land

The surface on the Powder River LBA Tract and the Alternative 2 configuration is owned by the United States of America, the State of Wyoming, PRCC, the Bridle Bit Ranch Company, and Jerry and Barbara Dilts (see Figure 3-14). The federally owned land is part of the Thunder Basin National Grassland, administered by the USFS. Livestock grazing (both cattle and sheep) is the principal land use of the area. The headquarters for one ranch, with two houses, barns, and corrals, is in the northwest corner of the area; three mobile homes are situated in the south-central part of the area.

Areas of disturbance within the Powder River LBA Tract include roads, oil and gas wells, and associated facilities. Disturbed land was characterized by bare ground or annual weeds, where native vegetation had been removed and nothing has been revegetated. A paved county road, "Antelope Road", runs north-south to the west of the LBA tract; a gravel county road, "Mackey Road", runs east-west through the northern edge of the tract. There were numerous bladed oil field roads to active or former well sites in the area (PRES 1996).

Six wells have been drilled and completed as producing oil and gas wells on the Powder River LBA Tract, and five wells are currently producing (Figure 3-14). These wells, which were originally drilled in the early 1980's, produce from the Late Cretaceous Turner and Sussex Sandstones, and the Early Cretaceous Dakota Formation. The majority of the oil and gas leases in the Powder River LBA Tract are federal leases. Facilities associated with these wells include production casing, which extends from the

surface to the zone of production, production equipment, and pipelines which gather the oil and gas produced by the individual wells and carries it to a larger pipeline or collection facility.

The surface on the Thundercloud LBA Tract and the Alternative 2 configuration is owned by the United States of America, KMCC, Atlantic Richfield, and the Gladys K. Norwood estate (see Figure 3-15). The federally owned land is part of the Thunder Basin National Grassland, administered by the USFS. The principal land use of the area within the tract is domestic grazing. Secondary land use is oil and gas production with incidental wildlife use (KMCC 1995).

Areas of disturbance within the Thundercloud LBA Tract include roads, oil and gas wells and disturbances associated with oil and gas production. Wyoming State Highway 450 and the BN/C&NW railroad spur serving both the Jacobs Ranch and Black Thunder mines both cross the southern portion of the LBA tract.

Sixteen wells have been drilled and completed as producing oil and gas wells on the Thundercloud LBA Tract, and eleven of these wells are currently producing (Figure 3-15). All of these wells, which were originally drilled in 1970 and 1971, produce from the Early Cretaceous Muddy Sandstone.

The majority of the oil and gas leases in the Thundercloud LBA Tract are federal leases (about 85%). Facilities associated with these wells include production casing (which extends from the surface to the zone of production), production equipment (which may be located on the surface and/or underground), and underground pipelines which gather the oil and gas produced by the individual wells and carry it to a larger transportation pipeline or collection facility.

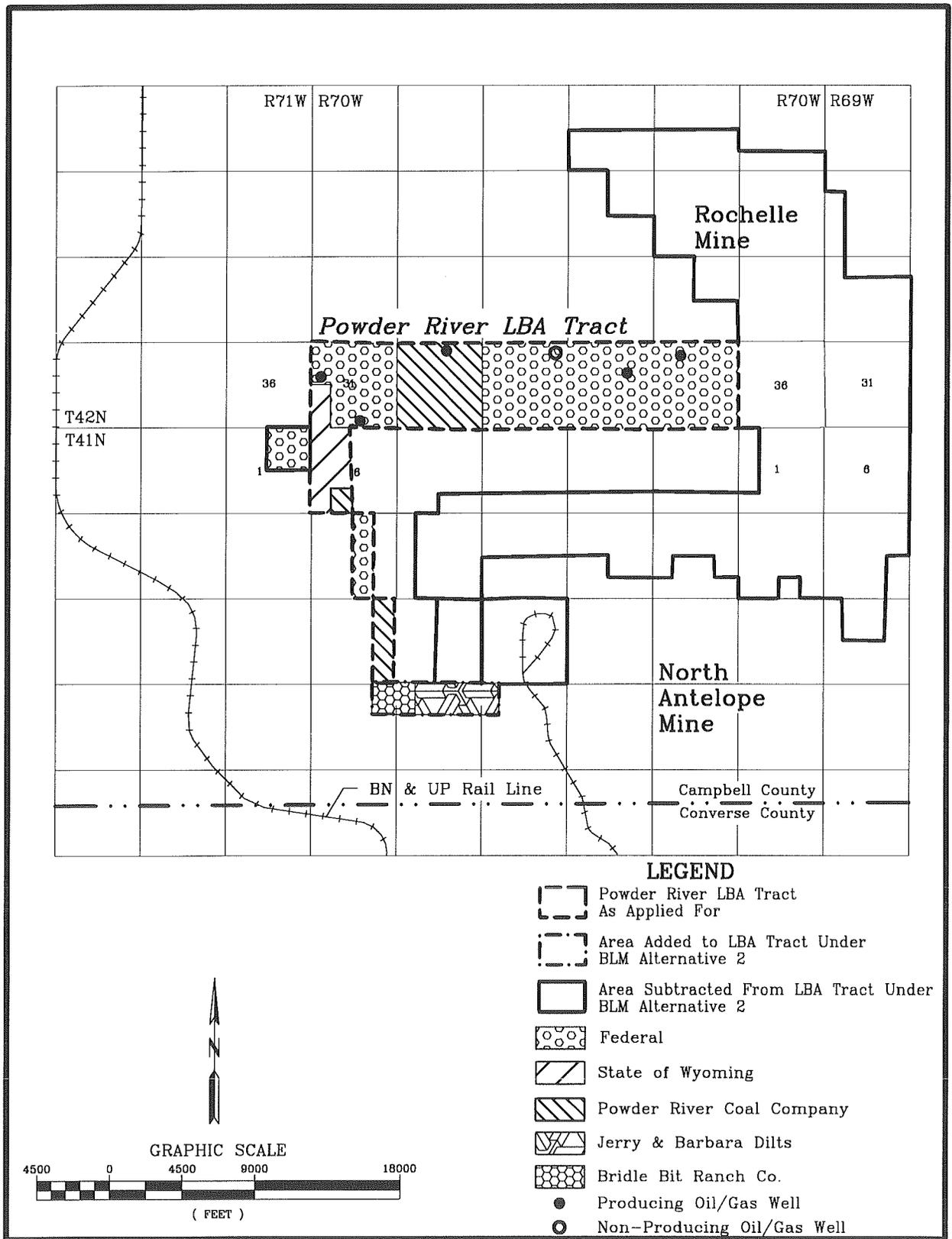


Figure 3-14. Surface Ownership Within the Powder River LBA Tract.

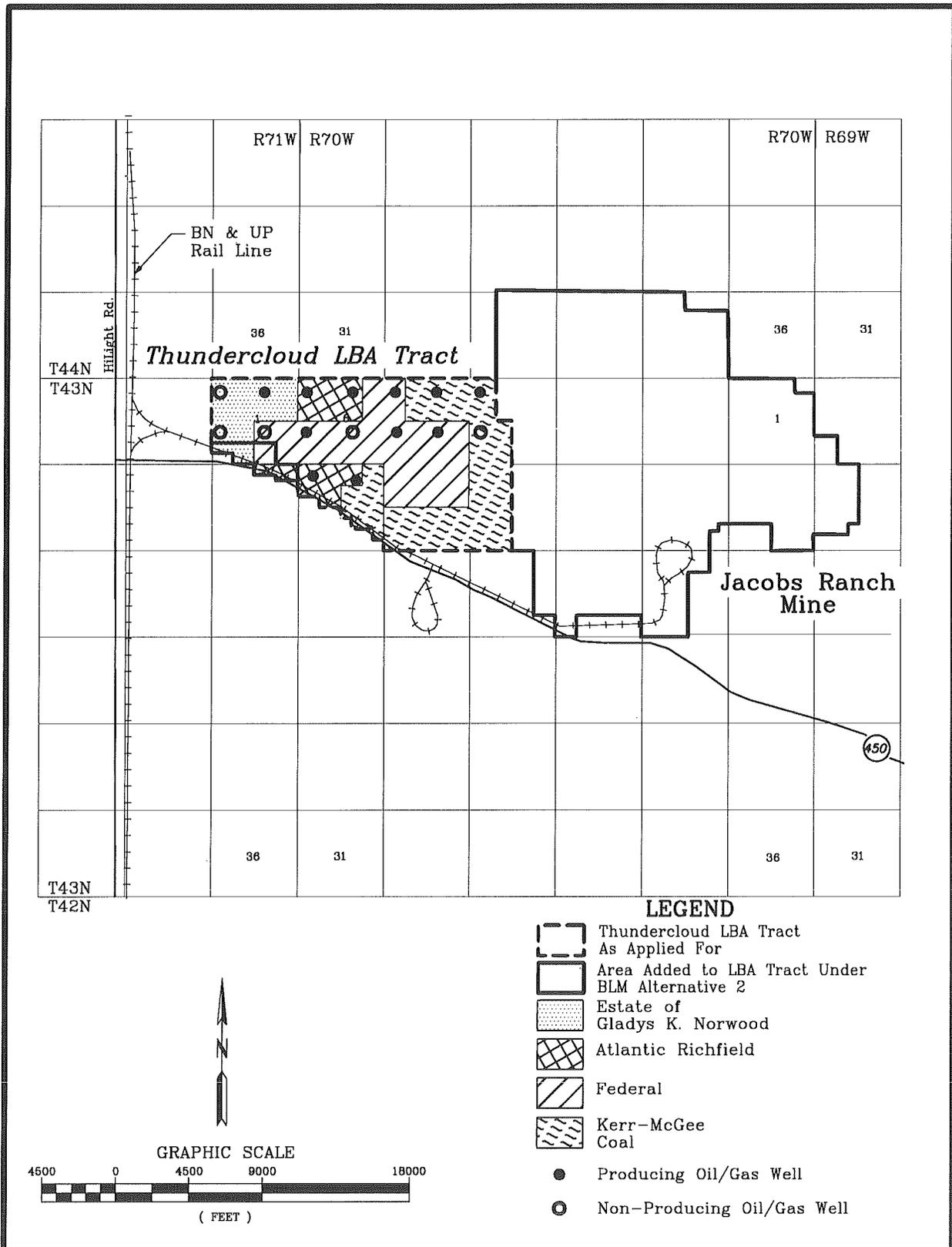


Figure 3-15. Surface Ownership Within the Thundercloud LBA Tract.

3.0 Affected Environment

Coal mining is a dominant land use in the area surrounding both LBA tracts. The existing Jacobs Ranch and North Antelope/Rochelle Mines are within a group of six operating surface coal mines located in southern Campbell and northern Converse Counties (see Figure 3-1). Coal production at these six mines increased by 87% between 1990 and 1996 (from about 70 million tons in 1990 to over 131 million tons in 1996). Since 1992, five maintenance coal leases have been or are about to be issued within this group, and applications have been submitted and are being processed for three more maintenance tracts in this same group, including the two LBA's being evaluated in this EIS (see Tables 1-1 and 1-2). BLM also received an application for a coal lease for a potential new mine start (New Keeline tract, see Table 1-2) located north of the Jacobs Ranch Mine (see Figure 1-1). This application was reviewed by the PRRCT at their April 23, 1997 public meeting. The PRRCT recommended that the BLM defer action on this application at this time. The application was subsequently rejected without prejudice by the BLM Wyoming State Director in a June 13, 1997 decision.

The Powder River LBA Tract also contains the right-of-way for the Powder River Energy Corporation (formerly Tri-County) high-voltage powerlines. Voltages in these lines range from 14.4/24.9 kilovolts (Kv) to 230 Kv.

Campbell County has no county-wide land use plan, and the LBA tracts have no designated zoning classification. The *City of Gillette/Campbell County Comprehensive Planning Program* (City of Gillette 1978) provides general land use goals and policies for state and federal coal leases in the county. The long-term land use objectives established

for the Thunder Basin National Grassland include livestock grazing and wildlife habitat.

Big game hunting is the principal recreational use in the analysis area. Land ownership within the PRB is largely private (approximately 80%), 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 management 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 publicly owned Thunder Basin National Grassland, BLM lands, and state school sections (normally Sections 16 and 36) are generally open to hunting if legal access is available.

Approximately 36% of the surface of the Thundercloud LBA Tract and 70% of the Powder River LBA Tract are federally owned and publicly accessible. The remaining lands are private, and recreational use is allowed only with landowner permission. Due to the federal land present, and its accessibility, sport hunting in varying degrees is conducted on both LBA tracts. Pronghorn, mule deer, and white-tailed deer occur on and adjacent to both LBA tracts. Sage grouse, mourning dove, waterfowl, cottontail rabbit, and coyote may also be harvested in the vicinity, and some trapping of red fox may occur.

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 1995). The Thundercloud LBA tract is within pronghorn antelope Hunt Area 24, which contains the Hilight Herd Unit. According to the WGFD, the primary problems associated with the management of this herd include achieving an adequate harvest and hunter distribution caused primarily by an abundance of privately owned land and poor access to the limited public land.

The 1995 postseason population estimate for the herd is 12,322 antelope, slightly over the objective of 11,000. In 1995, the WGFD issued 2,000 licenses for the Hilight Herd, an increase of 100 licenses from 1994 and 200 licenses from 1993. In the years 1991-1995, hunters on average harvested about 1,150 animals, with better than 85% success, and spent about 1.9 days per animal harvested. Approximately 2,500 recreation days were spent on antelope hunting in 1995, compared to the WGFD objective of 3,500. The primary cause of the population being over objective, and the recreation days being under objective, is lack of public access in the hunt area. Approximately two-thirds of the Thundercloud LBA tract is classified as yearlong habitat for antelope (habitat used by a portion of the animals yearlong and into which a significant influx of animals occurs during the winter), with none of the LBA tract or areas two miles adjacent classified as crucial or critical habitat. Pronghorn are widely scattered throughout the herd unit.

The Powder River LBA tract is within pronghorn Hunt Area 27, part of the Lance Creek Herd Unit which also includes Hunt Areas 6, 8, 9, and 29. The severe winter of 1992-93 resulted in an estimated 39% mortality in this herd, and WGFD thus

reduced the number of licenses in 1993 from 3,000 to 2,000. They have issued 2,750 licenses annually in the past two years and anticipate the pronghorn population will continue to grow to the post-hunt population objective of 27,000 (assuming normal reproduction and good weather conditions). The actual number of antelope in the herd unit has been approximately 22,500 over the past few years. Hunters annually harvest about 2,400 animals with better than 90% success and spend about 2.1 hunting days per animal harvested. The Powder River LBA tract is classified as yearlong habitat for antelope. The Lance Creek Herd Unit does not contain any designated crucial habitat. Antelope are widely scattered throughout the herd unit.

Both the Thundercloud and Powder River LBA tracts are in mule deer Hunt Area 21, part of the Thunder Basin Herd Unit, which also includes Hunt Areas 7, 8, 9, 10 and 11. This herd was above the 13,000 post-season deer population objective prior to the winter of 1992-93, which reduced the population to near objective. The current population is estimated at about 14,000. The WGFD has managed this herd for an annual harvest of approximately 1,800 deer, with hunter success running at about 71% and 3.9 days spent per deer harvested. The hunting season is designed to allow the population to grow; however, much of the preferred habitat in this herd unit occurs in drainage bottoms on private land, where grazing-related conflicts occur with landowners. The population objective may be increased in the future if landowner and public sentiment allow. About 45% of the Thundercloud LBA Tract is not within any designated mule deer habitat. Most of the Powder River LBA Tract is classified as mule deer "out" range, except for a small area of yearlong range along Porcupine and Corder Creeks. Although white-tailed deer and elk have been

seen occasionally in the vicinity of both LBA tracts, they are not common. The Rochelle Hills Elk Herd is located about six miles to the east of the LBA tracts. Elk Hunt Area 123 extends into the Thundercloud LBA Tract; and Elk Hunt Area 113 extends into the Powder River LBA Tract. However, very limited use of these lands by elk occurs. Elk favor the ponderosa pine/juniper woodlands, savanna, and steeper terrain habitat in the Rochelle Hills, east of the LBA tracts. This small herd (about 200 elk) is hunted every two to three years. Owing to their habituation to humans, these elk provide a significant amount of nonconsumptive recreational use. Landowners appear tolerant of the elk, and the WGFD will likely increase the population objective in the future. These elk are dispersing from the designated herd unit boundary, possibly due to density-dependent population factors related to limited habitat.

White-tailed deer are managed as part of the Thunder Basin Herd Unit, an area which extends from the Montana border through Gillette, Moorcroft, Newcastle, and south to Lusk and Douglas. White-tailed deer are not managed separately in this herd unit, but generally are included in the management of the corresponding mule deer herd units. White-tailed deer use is concentrated in riparian areas, which are predominantly privately owned. Doe/fawn licenses are therefore allocated to reduce grazing conflicts on private land in specific areas.

Public fishing opportunities are extremely limited in the PRB. Only one fishery exists in the general analysis area: Little Thunder Creek supports channel catfish and a variety of nongame fish. No fisheries exist on either of the LBA tracts.

3.12 Cultural Resources

Cultural resources, which are protected under the National Historic Preservation Act of 1966, are the nonrenewable remains of past human activity. The PRB appears to have been inhabited by aboriginal hunting and gathering people for more than 11,000 years. Throughout the prehistoric past, the area was used by highly mobile hunters and gatherers who exploited a wide variety of resources.

The general chronology for aboriginal occupation (dated as years before present [B.P.]) is:

- the Paleoindian period (11,000-7,500 years B.P.),
- the Archaic period (7,500-1,800 years B.P.),
- the Prehistoric period (1,800-400 years B.P.),
- the Protohistoric period (400-200 years B.P.), and
- the Historic period (200-120 years B.P.).

The Paleoindian period includes a series of cultural complexes identified by distinctive large projectile points (spear points) often associated with the remains of large, now-extinct mammals (mammoth, bison, camel, etc.). The Archaic period is characterized by a range of smaller side-notched, stemmed, or corner-notched projectile points and by more generalized subsistence pursuits including the gathering of plant resources. This lifeway continued to the late Prehistoric period, which is marked by a technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. During the Archaic and late Prehistoric periods, the PRB was occupied by small bands of hunters and gatherers whose movements were

determined to a large degree by seasonal and environmental changes which influenced the occurrence of subsistence resources (BLM 1979).

Protohistoric and early Historic sites are found in the PRB, including rare historic trade goods, sites and routes associated with early trappers and military expeditions, and early ranching attempts which date to the 1880's. A few small coal mining sites also exist.

Historic sites within the analysis area have been recorded as debris scatters representing shepherd camps and related activities. No historic trails are known or have been recorded on the LBA tracts; however, the Bozeman Trail crosses the southwestern portion of the PRB.

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 on the National Register of Historic Places (NRHP). That determination is made by the managing federal agency in consultation with the State Historic Preservation Office (SHPO).

Once a Class III survey is completed, site-specific testing or limited excavation is utilized, if necessary, to gather additional data which will: 1) determine the final evaluation status of a site and/or 2) form the basis of additional work that will 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.

Numerous Class III cultural resource inventories have been conducted by PRCC for lease expansion areas adjacent to the North Antelope and Rochelle Coal Mines. These inventories were conducted in 1990, 1991, 1993, 1994, 1995, and 1996.

Forty-five sites and 18 isolated finds have been identified by all cultural inventories conducted in the Powder River LBA tract and buffer zone. 23 sites are prehistoric, 19 are historic, and 3 contain both prehistoric and historic materials. The sites include 13 lithic scatters; 6 stone circles and stone circle complexes; 7 campsites; 3 historic foundations or depressions; 5 homesteads; 6 shepherd's camps; 4 cairns; and 4 historic debris scatters.

Of the 45 sites, one site, 48CA2675, is considered eligible to the NRHP, while 48CA1127 and 2617 remain unevaluated. Site 2675 is a historic homestead, while 1127 is a historic depression, possibly the remains of a structure or homestead, and 2617 is a historic rock cairn. These sites will require identification or description of protection measures in the mine plan, until such time as they have been evaluated or mitigated. NRIIP eligible sites or those of undetermined eligibility should be avoided during ground disturbing activities, or an approved testing or evaluation program should be implemented to determine eligibility and record data. Recent mitigation efforts have taken place at sites 48CA132, 1059, 1063 and 1065, sites considered eligible in related

3.0 Affected Environment

Table 3-10. Sites Recorded in the Class III Cultural Resource Inventory of the Powder River LBA Tract and Buffer Zone

Prehistoric sites	Historic sites	Multicomponent Sites
Lithic: 48CA129; 182; 207; 667; 771; 1061; 1126; 2610; 2632; 2633; 2669; 2679; 2683	Foundation, depression: 532; 1127; 2674 Sheepcamp: 667; 2668; 668; 1622; 2677; 2682	667; 2612; 2633
Stone Circle: 131; 132; 2672; 2678; 2680; 2681	Homestead: 694; 2670; 2675; 2795; 2796 Cairn: 949; 2617; 2676; 2684	
Campsite: 183; 1059; 1063; 1065; 2611; 2612; 2630	Historic debris: 2612; 2616; 2633; 2673	

mine plans, and no further work will be required under this plan for these sites.

The following sites have been determined not eligible to the NRHP 48CA129; 131; 182; 183; 207; 532; 667; 668; 694; 771; 949; 1061; 1126; 1622; 2610; 2611; 2612; 2616; 2630; 2632; 2633; 2669; 2670; 2672; 2673; 2674; 2678; 2679; 2680; 2681; 2682; 2683; 2684; 2795; 2796. SHPO consultation has not yet been completed for 3 sites: 48CA2668; 2676; and 2677; all three sites are recommended not eligible.

There is minimal potential for important surface cultural material to have gone unnoticed during the survey. Potential does exist for undetected, buried cultural material in some areas, however. This evaluation is based on the presence of recent (Holocene) deposition within the project area, particularly in the floodplain of Porcupine Creek. Portions of the floodplain would have been ideal camp locations for aboriginal inhabitants of the region. Any remains of these camps would have been buried quite rapidly by alluvium, making these sites undetectable by a standard pedestrian survey.

The widespread and extensive ground disturbance caused by coal mining activities could impact these potentially buried cultural resources. Cultural resource clearance has been recommended by the investigators for the project area adjacent to the North Antelope and Rochelle Coal Mines subject to the following stipulations to eliminate direct impacts to cultural resources:

- All disturbance should be restricted to inventoried areas.
- Ground disturbing activities within or adjacent to sites 48CA2675, 1127 and 2617 should be avoided until a testing, evaluation or data recovery program can be implemented.
- If evidence of additional prehistoric or historic sites (unanticipated discoveries) is located during ground disturbing activities, all activities within a 100-ft radius of the site(s) should cease immediately, and appropriate personnel within PRCC should be notified to assure proper

handling of the discovery by qualified archaeological personnel.

- All construction and maintenance personnel should be instructed of the confidentiality of site location information and that the collection of cultural material is prohibited (Mariah Associates, Inc. 1990 and 1991; CGM Services, Inc. 1993).

None of the above sites is currently listed on the NRHP, but sites considered eligible or unevaluated must be protected until consultation with the SHPO has occurred and the sites are identified for mitigation or release.

The Thundercloud LBA Tract and buffer zone was subjected to a Class III cultural resource inventory during 1995-1996. The survey was conducted by investigators from the Cultural Heritage Resource Office, University of Montana. The survey area covered 4,700 acres. This inventory has been sent to SHPO for review.

Forty-two sites (Table 3-11) and 45 isolated artifacts were located by the inventory. Only one site within the inventory area, 48CA1907, is considered eligible for nomination to the NRHP. Site 48CA400, a

historic grave and homestead site, is not considered eligible, but the grave, which lies immediately outside the project area, is recommended for avoidance. The remaining 40 sites and the isolated artifacts are considered not eligible for nomination to the NRHP (Cultural Heritage Resource Office and SHPO Nov. 25, 1997). Cultural sites located within the project area included 31 lithic scatters, 1 occupation, 1 homestead with associated grave, 2 historical structural remains, and 15 historic debris scatters. Nine of the sites were multi-component, containing both prehistoric and historic materials.

3.13 Native American Consultation

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, tepee rings, 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 no man-made features. No evidence of Native American heritage sites was observed during this investigation.

Table 3.11 Sites Recorded in the Class III Cultural Resource Inventory of the Thundercloud LBA Tract and Buffer Zone

Prehistoric Sites	Historic Sites	Multicomponent Sites
Lithic: 48CA2593; 2629; 2689; 2690; 2922; 2923; 2924; 2927; 2928; 2929; 2989; 2993; 2994; 2995; 2996; 2997; 2998; 2999; 3000; 3001; 3002; 3003; 3004; 3005; 3006; 3007	Homestead w/grave: 48CA400 Historic structure: 1315; 2988; Debris: 1907; 2459; 2921; 2926; 2990; 2992	48CA1907; 2690; 2919; 2920; 2925; 2986; 2987; 2991; 3008
Occupation: 1907		

3.0 Affected Environment

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

Native American tribes have been consulted at a general level for the 1995-1996 draft Buffalo Resource Area RMP. The Crow, Northern Cheyenne, Eastern Shoshone, Northern Arapaho, and Oglala Sioux tribal governments and representatives received scoping notices requesting information on any concerns they have relating to these lease applications. These tribal governments and representatives were sent certified letters providing them with information about the location of the LBA tracts and known sites on these tracts and requesting their help in identifying potentially significant religious or cultural sites on these two LBA tracts prior to a leasing decision on either of the tracts.

3.14 Paleontological Resources

The formations exposed on the surface of the PRB are the sedimentary Eocene Wasatch and Paleocene Fort Union formations, which are both 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 significant paleontological localities have been recorded on federal lands in or near the LBA tracts, which are within the BLM Buffalo Resource

Area and the Thunder Basin National Grassland. A paleontological survey has been conducted within and adjacent to the Powder River LBA Tract. Due to the absence of exposed bedrock on the Thundercloud LBA Tract, a paleontological survey was not considered necessary.

Lands adjacent to the Rochelle and North Antelope Mines and including the Powder River LBA Tract were surveyed to determine the potential for recovery of significant fossils prior to disturbance. These lands include approximately 3,000 acres in T42N, R70W, Sections 31, 32, 33, 34, and 35; and T41N, R70W, Sections 2, 3, 4, 5, 6, 7, 17, 18, and 20.

The Powder River LBA Tract was surveyed for paleontologic resources in compliance with the WDEQ/LQD and BLM requirements. The Powder River LBA Tract was surveyed during March 19-23 and April 1-4, 1990. Prior to the field survey, a literature search was conducted at the Geology and Vertebrate Paleontology libraries at the University of Wyoming to identify known fossil bearing sites in the area.

The Powder River LBA Tract was inspected by traversing the area on foot and examining sedimentary outcrops for fossils of all kinds. Certain areas prone to fossil accumulations were examined most carefully. These areas include 1) well-developed flats within and adjacent to outcrops, 2) ant hills (the Western Harvester Ant is known to incorporate small fossil bones and teeth into its hill), 3) sandstone blowouts or wind-deflated spots where lags of fossil bones and teeth might be expected, and 4) the bases of sandstone channels where coarse-grained material, including fossils, may accumulate.

Fossil plant material (wood and leaf impressions) of poor quality was found

scattered throughout the Fort Union Formation in the project area. These were most common in lignitic mudstones, ironstone concretions, and sandstones immediately overlying lignitic layers. In many places the ironstone appears to have precipitated around ancient tree trunks and root masses and are riddled with stem and leaf impressions.

At one site in NW1/4NW1/4 Section 2, T41N, R70W, leaf impressions were well preserved in a friable sandstone. Although fossil logs were common in the project area, they were not notably well preserved. Fossil plant remains are well known from the Fort Union Formation of the PRB and those found within the project area are not considered significant.

Fossil invertebrates, including the shells of the snail *Viviparus meeki* and the bivalve *Pleisielliptio priscus*, were found at the base of the Wasatch Formation in SE1/4 NW1/4 Section 7, T41N, R70W. These two fossil invertebrates are well known from the Wasatch Formation and equivalent aged rocks throughout Wyoming (Taylor 1975; Hanley 1976) and are not considered significant. A fragmentary tooth chip, probably part of a mammal incisor, was found in an ant hill in the same area as the invertebrate fossils. This tooth chip was too fragmentary to be identified and is not considered significant. No other mammalian fossil remains were found in the vicinity (Mariah Associates Inc. 1990).

3.15 Visual Resources

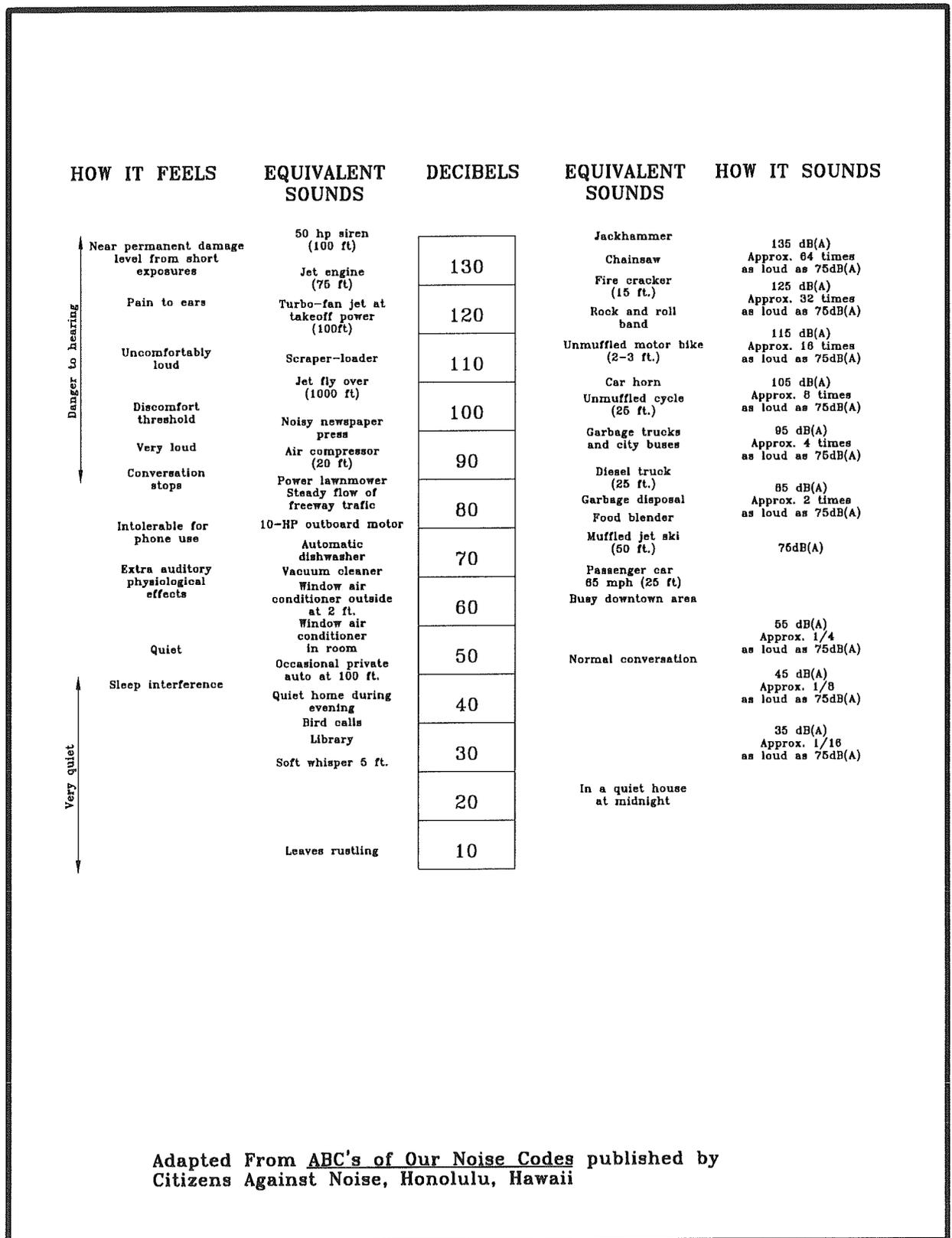
Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Landscapes within the general analysis area include rolling sagebrush and short-grass prairie, which are common throughout the

PRB. Existing surface mines form a nearly continuous band on the east side of Highway 59 from Gillette south about 75 mi. Other man-made intrusions include ranching activities (fences, homesteads, livestock), oil and gas development (pumpjacks, pipeline ROW's), and electric power transmission lines. The scenic quality in the immediate lease areas is fairly low because of the industrial nature of the adjacent existing mining operations.

The USFS has established visual quality objectives for the Thunder Basin National Grasslands (4,080 acres of which occur in the LBA tracts). The management objectives for these lands allow activities to visually dominate the landscape; however, alterations must be blended into the surrounding area so the original character (form, line, color, and texture) is retained. All mining activities on USFS lands must apply the standards and guidelines of the National Forest Visual Management System (USFS 1985).

3.16 Noise

Existing noise sources in the area include adjacent coal mining activities, traffic on State Highways 59 and 450, rail traffic, and wind. Studies of background noise levels at adjacent mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. Current noise levels in the Thundercloud and Powder River LBA Tracts are estimated to be 40-60 A-weighted decibels (dBA), with the noise level increasing with increasing proximity to active mining at the Jacobs Ranch Mine, Black Thunder Mine, North Antelope Mine and Rochelle Mine. Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992b). Figure 3-16 presents noise levels associated with some commonly heard sounds.



Adapted From ABC's of Our Noise Codes published by Citizens Against Noise, Honolulu, Hawaii

Figure 3-16. Relationship Between A-scale Decibel Readings and Sounds of Daily Life.

3.17 Transportation Facilities

Transportation resources in the vicinity of the Thundercloud LBA Tract include State Highways 59 and 450; the Gillette-Douglas rail spur used jointly by the Burlington Northern-Santa Fe and Union Pacific Railroads; pipelines; and local roads and accesses.

Since the Thundercloud LBA Tract as applied for would be an extension of the existing Jacobs Ranch Mine operations, the transportation facilities and infrastructure would be the same as those identified in the WDEQ/LQD Mine Permit for Term T3 approved on August 30, 1994, the BLM Resource Recovery and Protection Plan (R2P2) approved in February 1995, and the BLM logical mining unit approved in April 1995 (KMCC 1995).

Transportation resources in the vicinity of the Powder River LBA include both paved and gravel county roads, numerous pipelines and high voltage electrical lines, and local roads and accesses.

Since the Powder River LBA Tract as applied for would be an extension of the existing North Antelope and Rochelle Mine operations, the transportation facilities and infrastructure would be the same as those identified in the WDEQ/LQD Mine Permit for Term T4 approved on July 9, 1993 for the North Antelope Mine and on August 31, 1994 for the Rochelle Mine, the BLM R2P2 approved on February 1, 1996 for the North Antelope Mine and on September 19, 1994 and modified on January 13, 1997 for the Rochelle Mine, and the BLM logical mining unit approved on November 25, 1986 for the North Antelope Mine. (The Rochelle Mine does not have an logical mining unit).

Access to the Thundercloud LBA Tract is on Highway 450 via State Highway 59 or the Hilight Road. Access to the Powder River LBA Tract is on Mackey Road via State Highway 59 or the Hilight Road from the north or Antelope Road via State Highway 59 from the south.

Two-tracks also occur in the LBA tracts. The paved Hilight Road runs north/south about one mile to the west of the Thundercloud LBA tract, paralleling the Gillette-Douglas rail spur used jointly by the Burlington Northern-Santa Fe and Union Pacific Railroads. This rail line serves all the existing coal mines in the southern PRB.

The transportation system and facilities that would service the Powder River and Thundercloud LBA Tracts, if mined in conjunction with the adjacent mines as applied for, are in place. These facilities consist of a series of roads, a rail network, and internal transportation routes to facilitate mining operations. Transportation facilities within and adjacent to the Powder River and Thundercloud LBA Tracts are depicted on Figures 3-17 and 3-18, respectively.

3.18 Socioeconomics

The social and economic study area for the proposed project involves primarily Campbell County and the cities of Gillette and Wright; however, it also includes the city of Douglas in Converse County. For example, employees of the North Antelope and Rochelle Mines reside in Gillette (33%), Wright (8%), Douglas (46%), and Glenrock (13%) (BLM 1992c). The communities of Gillette and Douglas would most likely attract any new residents due to their current population levels and the availability of services and shopping amenities.

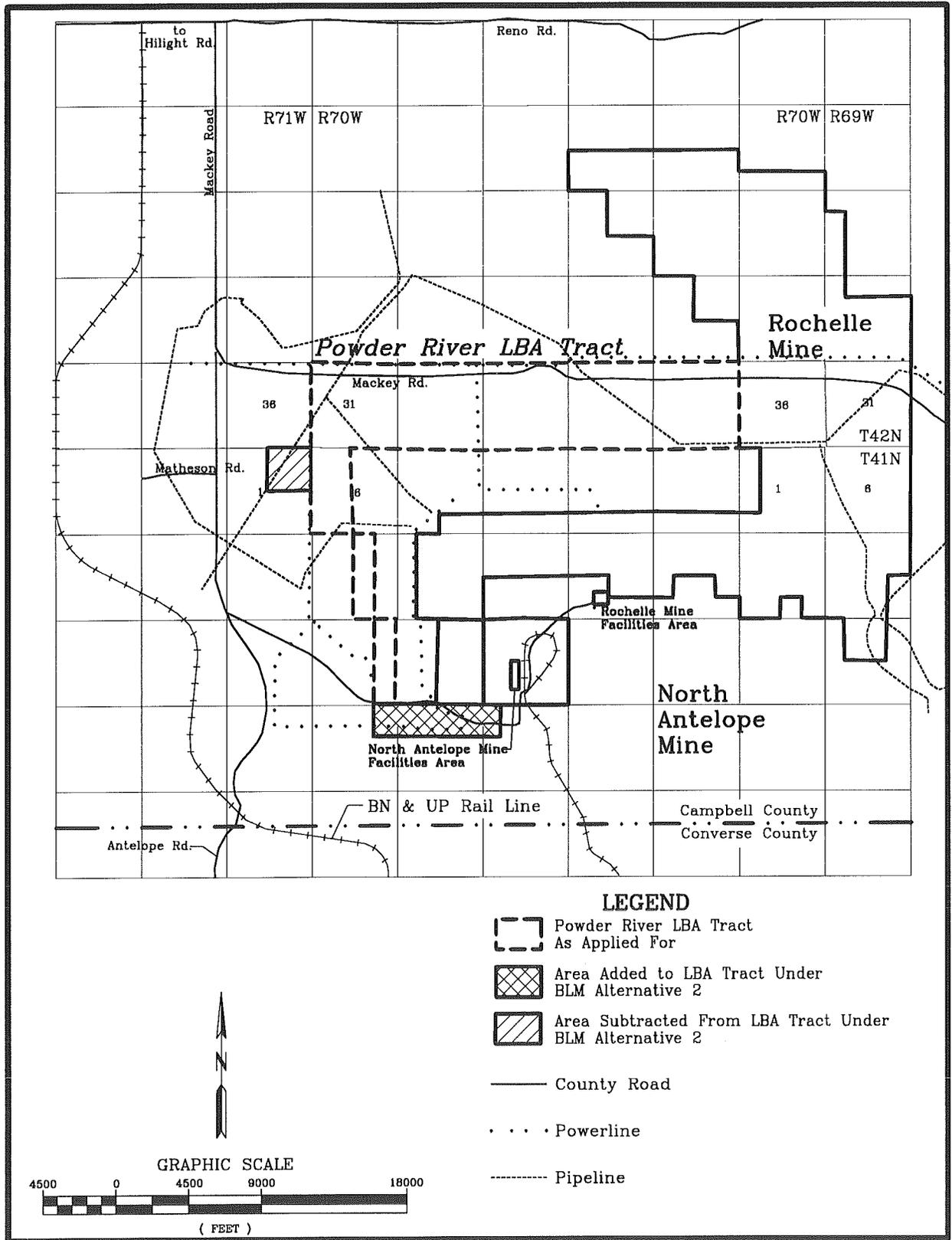


Figure 3-17. Transportation Facilities Within and Adjacent to the Powder River LBA Tract.

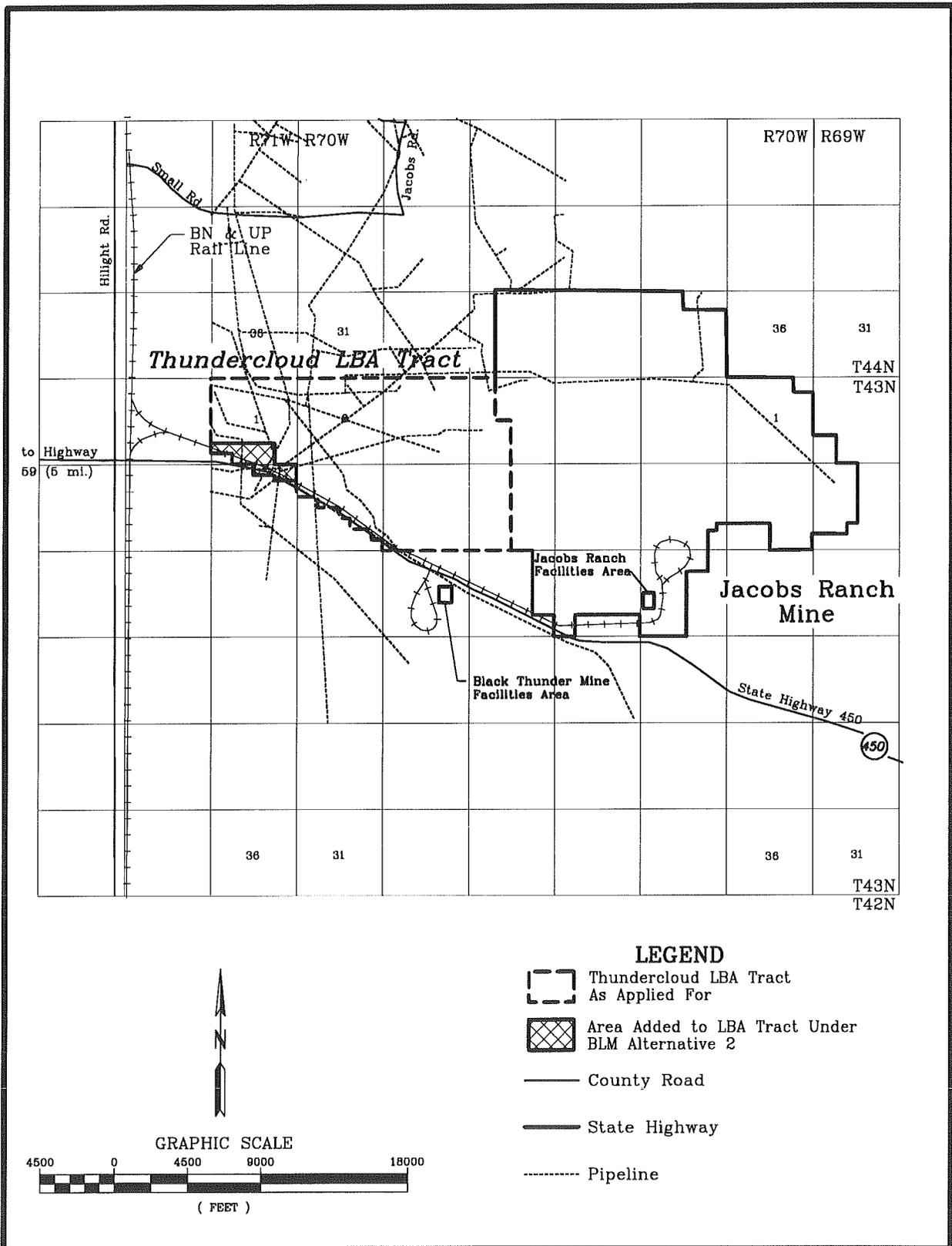


Figure 3-18. Transportation Facilities Within and Adjacent to the Thundercloud LBA Tract.

A comprehensive socioeconomic profile of the BLM Buffalo Resource Area (which includes all of Campbell County) was prepared for the BLM under contract with the Department of Agricultural Economics, College of Agriculture, through the University of Wyoming's Cooperative Extension Service (University of Wyoming 1994). Much of the following discussion is derived from this report. Additional data sources include the Wyoming Department of Commerce, Wyoming Division of Economic Analysis, Wyoming Department of Employment, Wyoming Economic Development Office, and personal communications with local community development staff.

In late September and early October of 1997, the Gillette News-Record published a series of tables showing the results of a study comparing 52 American counties. Some of the information that was published by the newspaper is also included in the following discussion.

3.18.1 Population

According to 1990 census data, Campbell County had a population of 29,370, with Gillette accounting for 17,635 of the county's residents and Wright with 1,200. Converse County's population in 1990 was listed as 11,128, with 5,076 of the county's residents residing in Douglas. The 1995 populations of Campbell and Converse Counties were 31,668 and 11,965, respectively, indicating increases from 1990 to 1995 of 7.8% (Campbell) and 7.5% (Converse) (U.S. Bureau of Census, USA Counties 1996 CD-ROM). In the study comparing 52 American counties, Campbell County ranked fourth in population growth.

3.18.2 Local Economy

Campbell County is the fastest growing coal-producing area in the U.S. and supplies about 25% of the national coal demand (BLM 1996g). The coal industry is the driving force behind the economic activity and employment in Campbell County.

Currently, 16 coal mines are in operation in the county, with one more (Antelope Mine) located just south of Campbell County in Converse County. Much of the remainder of the county's economy is based on oil and gas exploration and production, power generation, and agriculture.

Coal production in Campbell County has shown a strong upward growth trend over the past several years. In 1990, nearly 153 million tons of coal were produced, generating nearly \$1.4 billion of economic activity, including nearly \$182 million of personal income and 8,238 full-time jobs, 2,600 of which were directly associated with mines. The indirect and induced effects of sales from the coal industry are projected to contribute nearly 33% of the total economic activity for each dollar expended in the county. In 1995, 26% of the total employment and 44% of the total payroll in Campbell County were directly attributable to mining, and the average weekly mining wage (\$931) was 71% greater than the overall average weekly wage for jobs in the county (\$543).

Tax revenues from coal production in Campbell County are presented in Table 3-12. Sales and use taxes are distributed to cities and towns within each county and to the county's general fund. Severance taxes are collected by the state for the removal or extraction of resources such as oil, natural

Table 3-12. Fiscal Revenues from Coal Production in Campbell County

Year	Sales and Use Collections	Severance Tax Collections	Ad Valorem Tax Collections	Royalty Collections	Total Collections
1990	\$6.1 million	\$61.2 million	\$38.3 million	\$107.1 million	\$212.7 million
1995	\$8.8 million	\$87.6 million	\$54.8 million	\$153.3 million	\$304.5 million

¹ Includes estimated royalties on nonfederal production.

gas, coal, and trona. The State of Wyoming retains approximately 83% of the severance tax, and the remainder is returned to the cities, towns, and counties. Ad valorem taxes, which include property taxes, are collected by the county and disbursed to schools, cities, towns, the state foundation, and various other subdivisions within the county. Mineral royalties are collected on the amount of production and the value of that production. The current royalty rate for federal coal leases is 12.5%, with half of this revenue returned to the state. Additional sources of revenue include lease bonus bids (also split with state) and annual rentals that are paid to the federal government. The total fiscal benefit to the State of Wyoming from coal mining in the PRB has recently been estimated at \$1.10/ton of coal mined (University of Wyoming 1994).

3.18.3 Employment

Coal mining has changed a great deal since the 1970's, and new technologies have been a major contributor to these changes. The local coal mining labor force grew during the 1970's, but declined during the 1980's. Since 1973, overall production has risen while employee numbers have decreased. This employment decline followed large industry capital investments in facilities and production equipment, the majority of which was aimed at increasing productivity. Direct employment in the area's coal mining industry has remained relatively constant

over the last few years at approximately 2,600 full-time employees.

As of May 1997, the total labor force in Campbell County stood at 18,590, with an unemployment rate of 4.6% (compared to 4.4% in May 1996, Wyoming Department of Employment, Research and Planning 1997). About 2,651 people were directly employed in coal mining, representing about 15% of the employed labor force (Campbell County 1997). In the study comparing 52 American counties, Campbell County ranked second in job growth and second in percent of mining jobs.

As of May 1997, the total Converse County labor force was 6,630, with an unemployment rate of 5.3%, compared to 4.4% a year earlier. About 657 people, or 10% of the labor force, were directly employed by area coal mines (NEWEDC 1997).

3.18.4 Housing

In 1996, Gillette contained 7,775 housing units, and Wright contained 497 housing units, according to the Campbell County Economic Development Corporation (1997 Community Profile). According to the 1990 census, Campbell County contained 11,538 housing units, 7,078 of which were in Gillette. In 1996, the average cost of a new single family home was \$165,000; the average cost of an existing family home was

3.0 Affected Environment

\$90,500. Vacant housing in Gillette is estimated at approximately 549 units.

Douglas contained 2,267 housing units in 1992, with an estimated 59 vacant units, including 24 single-family homes, 30 mobile homes, and five multi-family units. The average price of a new 3-bedroom home in Douglas in 1996 was \$89,000, while that of an existing 3-bedroom home was \$74,000 (NEWEDC 1997).

3.18.5 Local Government Facilities and Services

Gillette maintained a steady population growth from 1987, when it totaled 17,054, until 1996, when it was estimated at 21,585. According to a recent article in the Gillette News Record (1997), however, population dropped slightly in 1997, to about 21,410. Owing to the substantial revenues generated by coal production, local government facilities and services have kept pace with this growth and are adequate for the current population. The primary exception is a lack of space in the Gillette high school; however, approval of a recent bond issue will facilitate construction of a new school. The 1996 population of Douglas (5,479) is lower than its peak of 7,800 in 1982, and local government facilities and services are generally adequate for the current population. Primary exceptions include a shortage of physicians, although several physicians have recently moved to the area. The town also has limited building space (platted lots) available for future growth. Some indoor recreational facilities may also be near or at capacity.

Wright was established in 1976 by ARCO and is the nearest community to the southern group of mines. Wright's population peaked in 1985 at approximately 1,800 and decreased to 1,175 by 1994. Over the past

few years, many of the coal mines have transitioned from working 10-hour shifts to 12-hour shifts. Many miners have thus relocated to Wright to cut down on commuting time, and the population has recently increased to approximately 1,400. Several coal service companies are also cutting back on travel allotments, which is further adding to Wright's current population growth. Wright's infrastructure is more than adequate for the current and planned population, and with the current building going on, it can double in population before services become limiting.

3.18.6 Social Conditions

Despite past boom and bust cycles in the area's economy, a relatively stable social setting now exists in these communities. 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.

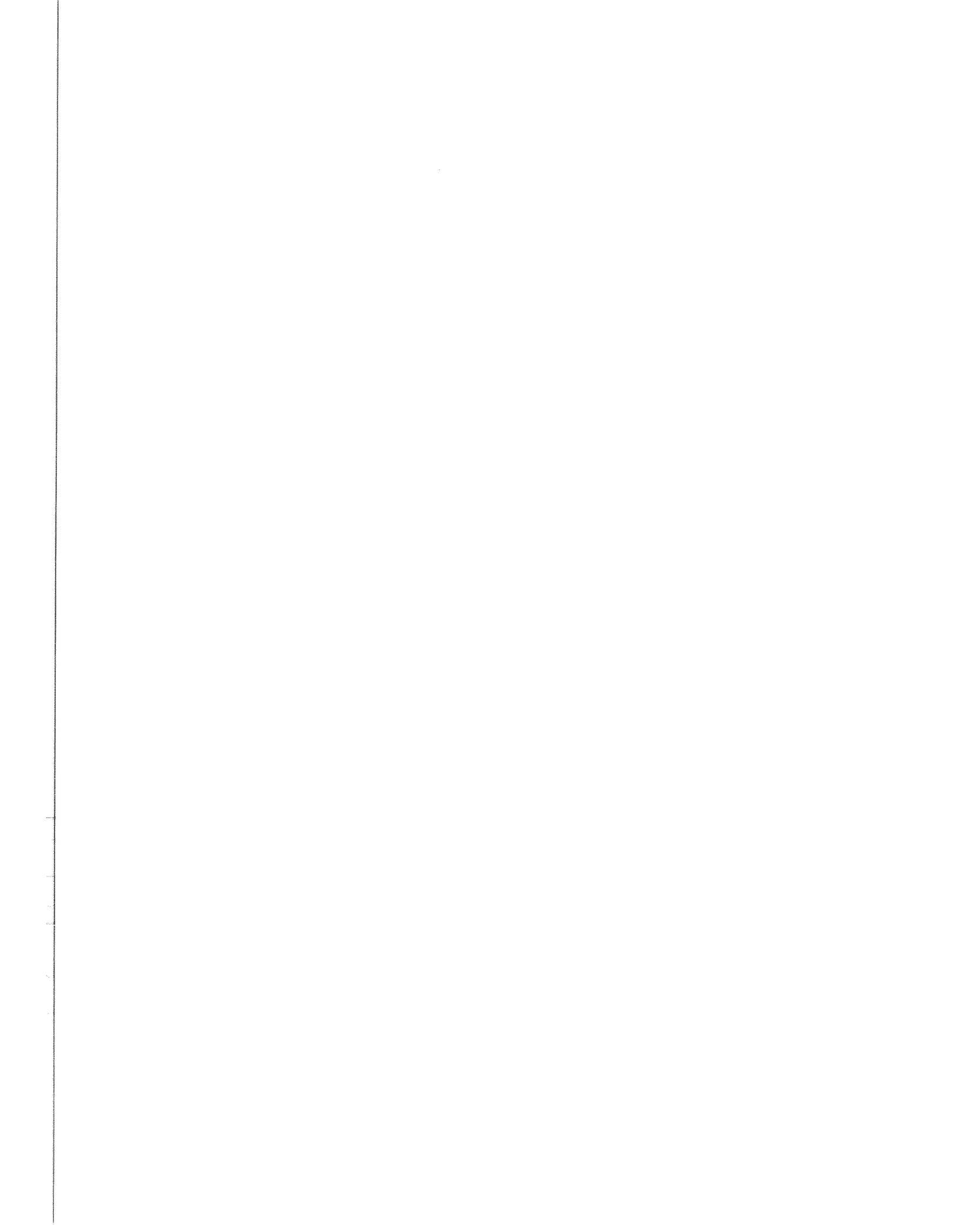
3.18.7 Environmental Justice

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, etc. 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 Campbell County, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of a coal mine within the general analysis 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.



4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences that may result from implementing the Proposed Action, Alternative 2, and the No-Action Alternative. The effect or impact a consequence will have on the quality of the human environment is also discussed. For instance, the consequence of an action may be to greatly increase the number of roads in an area. The impact of this consequence would depend on an individual's (or a population of individuals) preferred use of that area (e.g., opportunities for road-based recreation would be increased, but opportunities for primitive recreational activities and solitude would be decreased).

If the LBA tracts are leased to the applicants as maintenance tracts under one of the action alternatives, the permit areas for the adjacent mines would have to be amended to include the new lease areas before they can be disturbed. Table 4-1 shows the existing areas to be mined and disturbance areas for the applicants' mines (which represents the No-Action Alternative), and how those areas will change under the Proposed Action and Alternative 2. If the tracts are leased, the area that will have to be added to the existing permit areas would be the LBA tracts themselves 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. Portions of the LBA tracts that are adjacent to the existing leases will be disturbed under the current mining plans in order to recover the coal in the existing leases. The environmental consequences of implementing either the Proposed Action or Alternative 2 are very similar because the

size of the area that will be disturbed under each alternative is similar.

Surface mining and reclamation have been ongoing in the PRB for two decades. During this time, effective reclamation technology and mitigation measures have been developed and continue to be refined. Reclamation plans are based on a postmining topography design which incorporates stable land forms with topographic diversity, restoration of premining surface water flow and minimization of disturbance outside mining areas. Certain measures required by SMCRA and/or Wyoming statutes that reduce impacts are considered to be part of the Proposed Action, as discussed in Chapter 2. Some of these measures are also described in this section. The BLM and USFS also attach special stipulations to all coal leases (Appendix D). In addition, 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 operation will comply with the performance standards of the OSM-approved Wyoming program. Appendix A presents a list of federal and state permit approvals that would be necessary prior to mining either LBA tract. These regulations are designed to guarantee mitigation of impacts from surface coal mining. The impact assessment in the following sections considers all measures required by federal and state regulatory authorities as part of the action alternatives.

Section 4.1 analyzes the direct and indirect impacts associated with leasing and mining the LBA tracts under the Proposed Action and Alternative 2. Section 4.2 presents the probable environmental consequences of the No-Action Alternative (not issuing a lease for the tracts). Section 4.3 discusses regulatory compliance, mitigation, and monitoring in

Table 4-1. Comparison of Impacts of Alternative LBA Tracts on Mine Disturbance Area

Mine Configuration	Additional Area to be Mined (acres)	Additional Coal to be Mined ¹ (million tons)	Total Area to be Mined (acres)	Percent Increase in Area to be Mined	Total Area to be Disturbed ² (acres)	Percent Increase in Area to be Disturbed
<u>North Antelope/Rochelle</u>						
Existing Mine Permit	---	---	11,434	---	11,948	---
Proposed Action	4,023	489	15,457	35	16,574	39
Alternative 2	4,224	505	15,658	37	16,617	39
<u>Jacobs Ranch</u>						
Existing Mine Permit	---	---	6,955	---	8,122	---
Proposed Action	3,396	384	10,351	49	11,871	46
Alternative 2	3,546	389	10,501	51	11,956	47
<u>Both Mines</u>						
Existing Permit Area	---	---	18,389	---	20,070	---
Proposed Action	7,419	873	25,808	40	28,445	42
Alternative 2	7,770	894	26,159	42	28,573	42

Notes: ¹ Additional coal to be mined = leased coal x recovery factor. For Powder River LBA Tract, additional leased coal = 515 million tons for Proposed Action and 532 million tons for Alternative 2 and recovery = 95% based on historic operations. For Thundercloud LBA Tract, additional leased coal = 427 million tons for Proposed Action and 432 million tons for Alternative 2 and recovery = 90% based on historic operations.

² Total disturbed area includes mined area and areas disturbed for construction of facilities, access roads, haulroads, rail facilities, stockpiles and miscellaneous areas. Disturbed area for this table assumes the LBA tracts would be mined as maintenance tracts for existing mines.

terms of what is required by federal and/or state law (and is therefore part of the Proposed Action and alternatives) and any additional mitigation and monitoring that may be required. Section 4.4 summarizes the residual effects of the Proposed Action and Alternative 2. Section 4.5 discusses the cumulative impacts that would occur if these lands were mined when added to other past, present, and reasonably foreseeable future actions. The cumulative impact analysis includes a discussion of four projects that are in progress or proposed in the area of the LBA tracts and that would occur independently of leasing the LBA tracts. These projects are: 1) construction of the North Rochelle Mine facilities and rail loop which began in June of 1997; 2) construction and operation of the ENCOAL Plant, which has been proposed within the rail loop at North Rochelle; 3) construction and operation of the Two Elk power plant, which has been proposed east of the Black Thunder Mine; and 4) the construction of the proposed DM&E Railroad line. Section 4.6 analyzes the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. Section 4.7 presents the irreversible and irretrievable commitments of resources that would occur with implementation of the Proposed Action or Alternative 2.

4.1 Direct And Indirect Impacts Of Action Alternatives

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.

4.1.1 Topography and Physiography

Surface coal mining would permanently alter the topography of the LBA tracts. Topsoil would be removed from the land, overburden would be blasted and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography on the LBA tracts would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Spoil and topsoil may be stockpiled for later use in reclamation. Mills and Shipley Draws and North Prong Little Thunder Creek (at the Thundercloud LBA Tract) and Porcupine Creek (at the Powder River LBA Tract) will be diverted into temporary channels or blocked to prevent flooding of the pits. A direct, permanent impact would be topographic moderation. The restored land surface would contain gentler topographic features, but the basic drainage network would be restored. Following reclamation, the average surface elevation would be approximately 46 ft lower at the Powder River LBA Tract and 43 ft lower at the Thundercloud LBA Tract due to removal of the coal. (The removal of the coal would be partially offset by the overburden swelling that occurs when the overburden is blasted and removed.) The land surface would be restored to the approximate original contour or to a configuration approved by WDEQ/LQD during the permit revision process.

4.0 Environmental Consequences

Direct adverse impacts resulting from this topographic moderation would include a reduction in microhabitats (e.g., cutbank slopes) 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 that would result from the lower and flatter terrain is reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may indirectly decrease erosion, increase vegetative productivity, and potentially accelerate recharge of groundwater. The approximate original drainage pattern would be restored, and stock ponds and playas would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

Either action alternative would result in an increase in the area at the respective mines where topography would be permanently altered (Table 4-1).

The impacts on topography from mining and reclamation, as discussed above, are both beneficial and adverse. Since the area to be affected under the action alternatives represents an increase in the area that will be affected under current conditions, the impacts are considered moderate.

4.1.2 Geology and Minerals

For the Powder River LBA Tract, mining would remove an average of 228 ft of overburden and 73 ft of coal over about 4,023 acres under the Proposed Action or 4,224 acres under Alternative 2. Mining would remove an average of 195 ft of

overburden and 68 ft of coal over about 3,396 acres for the Thundercloud LBA Tract under the Proposed Action, and 3,546 acres under Alternative 2.

The replaced overburden would be a relatively homogeneous (compared to the premining layered overburden) and partly recompacted mixture averaging about 256 ft deep on the Powder River LBA Tract and 220 ft deep on the Thundercloud LBA Tract. Depending upon the alternative, there would be an increase in tonnage to be mined of up to 52% at the North Antelope/Rochelle Mines and up to 80% at Jacobs Ranch. Approximately 942 million additional tons of coal would be leased under the Proposed Action, compared to 964 million tons under Alternative 2.

The geology from the base of the coal to the land surface would be subject to permanent change on the LBA tracts under either action alternative. The subsurface characteristics of these lands would be radically changed by mining. The replaced overburden (spoil) would be a mixture of the geologically distinct layers of sandstone, siltstone, and shales that currently exist. The resulting physical characteristics would also be significantly altered.

Development of other minerals potentially present on the LBA tracts could not occur during mining; however, development of these resources could occur following mining. Coal bed methane associated with the removed coal would be irretrievably lost. There are currently oil wells present on both LBA tracts. In order to remove the coal, operating wells would have to be shut in during mining or abandoned if it is not economical to re-establish or redrill the wells following mining. Conflict could arise between oil and gas and coal lease holders. BLM is required to manage federal lands on

a multiple use basis; 43 CFR 3400.1(b) provides that "the presence of deposits of other minerals...or production of deposits of other minerals shall not preclude the granting of an exploration license, a license to mine or a lease for the exploration, development or production of coal deposits on the same lands with suitable stipulations for simultaneous operations." The special stipulations that Wyoming BLM attaches to new coal leases include a stipulation relating to coal leases issued within producing oil and gas fields. In the event of a conflict, BLM policy is to encourage negotiation and resolution of resource recovery issues between the conflicting interests.

4.1.3 Soils

Consequences to soil resources from mining the LBA tracts 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, and chemical composition. The soils would be much more uniform in type, thickness, and texture. Since only the better soils would be salvaged for use in reclamation, the average quality of topsoil would be improved following reclamation. The replaced topsoil would support a stable and productive vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Surface coal mining and reclamation would directly impact 8,375 acres of soil resources on and adjacent to the LBA tracts (8,503 acres for Alternative 2) by increasing near-surface bulk density, which would then indirectly influence infiltration and runoff. The soils would tend to become more uniform in type, thickness, and texture (e.g., clayey and sandy soils may get mixed,

resulting in a sandy clay loam). This uniform mixture would then be redistributed to a fairly even depth of about 18 to 24 inches in both LBA tracts. The chemical make-up and soil nutrient distribution would be more uniform in the mixed soils, resulting in more uniform vegetative productivity on the reclaimed land. Direct biological impacts would include a short-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil which is stockpiled before placement. Mining the tracts as extensions of existing mines will minimize the amount of both topsoil and spoil that must be stockpiled compared to mining the tracts as new-start mines.

Following reclamation, soil loss due to steep topography may decrease on the LBA tracts as a result of the topographic moderation. Due to state regulatory requirements, soil losses during mining will be minimal; sediment control structures will trap eroded soil and revegetation will reduce wind erosion. These measures are considered part of the action alternatives.

4.1.4 Air Quality

The WDEQ/AQD has issued air quality Permits to Construct for the North Antelope/Rochelle and Jacobs Ranch Mines. North Antelope and Rochelle are authorized to mine at a combined maximum rate of 65 million tons per year and Jacobs Ranch is authorized to produce at a maximum rate of 35 million tons per year. The actual production rates depend on market conditions and contracts. In 1996, the North Antelope/Rochelle combined production was 54.9 million tons, and production at Jacobs Ranch Mine was 24.5 million tons. As shown on Tables 2-1 and 2-2 of Chapter 2, anticipated annual production on the North Antelope and Rochelle Mines including the

Powder River LBA Tract is 65 million tons per year; at the Jacobs Ranch Mine including the Thundercloud LBA Tract production would be 35 million tons per year. Subject to market constraints, the mines plan to achieve their maximum permitted coal production rates by year 2002.

The air quality permits were based on the results of computer modeling that predicted no violation of air quality standards and demonstrated that emissions would have no significant cumulative effect when added to emissions from neighboring mines at currently permitted production rates. PRCC and KMCC would mine the LBA tracts and their existing leases using the same equipment with similar emission control methods. The overburden and coal thicknesses on the LBA tracts are similar to the existing leases. At the currently permitted maximum rates, acquisition of the LBA tracts would allow production to be extended for 7.5 to 7.8 years at the North Antelope/Rochelle Mines and 11.0 to 11.1 years at the Jacobs Ranch Mine, respectively. As a result, there would not be an increase in direct and indirect impacts to air quality, but there would be a continuation of the existing permitted impacts.

Air quality impacts resulting from, or associated with, mining operations would be limited primarily to the operational life of the mines. During the time the LBA tracts are mined, the elevated TSP levels 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 attained. As with current operations, mining would occur near Highway 450, Highway 59, and Antelope and Mackey County Roads, making dust visible to the public. The required mitigation

measures, which are discussed in Section 4.3.4, would minimize this impact.

Impacts from the Proposed Action and Alternative 2 would not be substantially different, except that a slightly larger area would be mined under Alternative 2. Haul distances from the pits to the preparation plants would increase slightly from current levels, so dust emissions may increase in proportion to this increased haul distance. Blasting is not a major source of emissions at PRB mines (PM₁₀ emission inventories show that overburden and coal blasting comprise less than 1% of the total emissions). Overburden removal, wind erosion, and coal haul roads generate the majority of dust.

The nearest Class I area is located approximately 80 miles east at Wind Cave National Park in southwestern South Dakota. Mines are not considered to be major emitting facilities in accordance with Section 24 of WDEQ/AQD Rules and Regulations. Therefore, mines are not required to evaluate their impacts on that Class I area.

4.1.5 Water Resources

Surface Water

Changes in runoff characteristics and sediment discharges would occur during mining of the LBA tracts because of changes in the location of diversions and 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. Therefore, the sediment would be deposited in ponds or other sediment-control devices. However, sediment produced by large storms (i.e., greater than the 10-year,

24-hour storm) could adversely impact downstream areas. Since the tracts would be mined as extensions of existing mines under the action alternatives, the amount of area disturbed and not reclaimed at any given time will not significantly increase due to leasing. WDEQ/LQD would also require a monitoring program to assure that ponds would always have adequate space reserved for sediment accumulation.

Runoff rates might increase on the LBA tracts after reclamation due to loss of soil structure. However, 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 premining levels. The probable decrease in average slope of the reclaimed land would increase infiltration and reduce peak flows.

After mining and reclamation are complete, surface water flow, quality, and sediment discharge from the LBA tracts would approximate premining conditions. The impacts described above would be similar for both the Proposed Action and Alternative 2.

Groundwater

Mining of the LBA tracts would impact the groundwater resource quantity in two ways: 1) Mining would remove the coal aquifer and any overburden aquifers on the mined land and replace them with unconsolidated overburden (spoils); and 2) water levels in the coal and overburden aquifers adjacent to the mine would continue to be depressed as a result of seepage and dewatering from the open cut on the LBA tracts. The area subject to lower water levels would be increased roughly in proportion to the increase in area affected by mining.

Mining the LBA tracts would remove aquifers on 4,023.5 acres (Proposed Action) and 4,224.2 acres (Alternative 2) on the Powder River LBA Tract and 3,395.9 acres (Proposed Action) or 3,545.5 acres (Alternative 2) on the Thundercloud LBA Tract. Mining within the LBA tracts will remove both the coal and overburden aquifers and replace the two separate aquifer units with mine backfill (spoil) composed of an unlayered mixture of shale, siltstone, and sand that makes up the existing Wasatch Formation overburden. Impacts to the local groundwater system resulting from mining include completely dewatering the coal and overburden within the area of coal removal, and extending drawdowns some distance away from the active mine area. The extent that drawdowns will propagate away from the mine pits is a function of the water-bearing properties of the aquifer materials. In materials with high transmissivity, drawdowns will extend further from the pit face than in materials with lower transmissivity. In general, due to the geologic makeup of the Wasatch Formation overburden (discontinuous sands in a matrix of shale), overburden drawdowns do not extend great distances from the active mine pit. Overburden monitor wells farther than 2,000 ft from the active pits showed less than 4 ft of drawdown at North Antelope/Rochelle and less than 2 ft of drawdown at Jacobs Ranch as of 1995 (Hydro Engineering 1996a). Because of the generally regional continuity and higher transmissivity within the Wyodak coal seam, drawdowns propagate much further in the coal aquifer than in the overburden. Coal drawdowns from 1980 to 1995, as presented in the 15-year GAGMO report (Hydro Engineering 1996a) are generally in excess of 5 ft within four miles of the active pits at North Antelope/Rochelle Mines and within one mile of the active pit at Jacobs Ranch Mine.

The subcoal Fort Union aquifers are not removed or disturbed by coal mining, so they are not directly impacted by coal mining activity. Both PRCC and KMCC have water supply wells completed in aquifers below the coal. If the LBA tracts are leased by the applicants, water would be produced from these wells for a longer period of time; neither PRCC or KMCC will require additional sub-coal wells to mine the LBA tracts.

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 spoils. Research conducted by the Montana Bureau of Mines and Geology 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 will not be compromised (Van Voast and Reiten 1988).

Groundwater quality within the backfill aquifer at the Thundercloud and Powder River LBA Tracts can be expected to be similar to the groundwater quality measured in wells completed in the backfill at the Jacobs Ranch and North Antelope Mines (to date no backfill wells have been completed at Rochelle Mine). TDS concentrations observed in the backfill aquifers at these mines are generally higher than those found in the undisturbed Wasatch or Wyodak Coal aquifers. At the North Antelope Mine, 1995 TDS concentrations in the backfill were variable and ranged from 1,954 mg/L to

15,307 mg/L (Hydro Engineering 1996b) with a geometric mean of 4,339 mg/L. Five of the seven backfill wells present at the North Antelope Mine show decreasing TDS concentration with time, decreasing an average of 30% from 1986 to 1995. Two wells are completed in the backfill at the Jacobs Ranch Mine, with 1995 TDS concentrations averaging 4,178 mg/L. A third well was completed in the Jacobs Ranch backfill in 1994; however, data from this well are insufficient to establish a trend. TDS concentrations in the Jacobs Ranch backfill wells have increased over time. 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 areas in the northern PRB. Postmining 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. In general, the mine backfill groundwater TDS can be expected to range from 3,000 - 6,000 mg/L, similar to the premining Wasatch Formation aquifer, and meet Wyoming Class III standards for use as stock water.

The hydraulic properties of the backfill aquifer reported in the permit documents are variable but in general comparable to the Wasatch Formation overburden and Wyodak Coal. At the Jacobs Ranch Mine, the hydraulic conductivity of the backfill has been measured at one well, and the average of two tests is 20 ft/day, which exceeds the high of 1.6 ft/day reported for the coal aquifer at the Jacobs Ranch Mine. At the North Antelope/Rochelle Mines, the backfill aquifer has been tested at four wells, and the average hydraulic conductivity is 36 ft/day,

which also exceeds the average hydraulic conductivity (9.5 ft/day) reported for the Wyodak Coal within one mile of the Powder River LBA Tract. The data available indicate that the hydraulic conductivity of the backfill would be greater than or equal to premining coal values, suggesting that wells completed in the backfill would provide yields greater than or equal to premining coal wells.

Direct and indirect impacts to the groundwater system resulting from mining the two LBA tracts would add to the cumulative impacts that will occur due to mining existing leases. These impacts are discussed in section 4.5.5.

4.1.6 Alluvial Valley Floors

The mine permitting regulatory authorities (state and federal) have not yet formally declared whether or not there are any AVF's within the two LBA tracts. However, within the two lease tracts the streams and agricultural uses appear similar to areas approved for mining downstream on the existing leases. Therefore, it is unlikely that any portions of the streams within the LBA tracts meet the criteria to be AVF's significant to agriculture.

Streamflows in Mills and Shipley Draws on the Thundercloud LBA Tract and Porcupine Creek and Corder Creek on the Powder River LBA Tract would be diverted around the active mining areas in temporary diversion ditches or captured in flood-control reservoirs above the pit. If flood-control impoundments are used, it will be necessary to evacuate them following major events to provide space for the next flood. Consequently, disruptions to streamflows which might supply downstream AVF's are expected to be negligible. Groundwater intercepted by the mine pits will be routed

through settling ponds to meet state and federal quality criteria, and the pond discharges will likely increase the frequency and amount of flows in these streams, thereby increasing surface water supplies to downstream AVF's.

If the LBA tracts are mined as extensions of existing operations, the mining will extend upstream on streams already affected by mining. Therefore, no direct, indirect, or cumulative impacts are anticipated to off-site AVF's through mining of either of the LBA tracts.

4.1.7 Wetlands

All existing wetlands on the LBA tracts would be destroyed by mining operations. However, COE requirements to replace all impacted wetlands would mitigate this loss, so environmental impacts would be short-term (i.e., during mining and reclamation). During the period of time after mining and before wetland replacement, wetland functions would be lost. Also, the reclamation may not replace exact functions and landscape features.

4.1.8 Vegetation

Under the Proposed Action, mining of the LBA tracts would progressively remove the native vegetation on 4,626 acres on and near the Powder River LBA Tract and 3,749 acres on and near the Thundercloud LBA Tract. Acreage disturbed under Alternative 2 for the Powder River LBA Tract would be 4,669, while acreage affected under Alternative 2 for the Thundercloud LBA Tract would be 3,834 acres. 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

4.0 Environmental Consequences

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 2 to 4 years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. Some roads and facilities will not be reclaimed until the end of mining. No life-of-mine facilities would be located on the LBA tracts under the action alternatives, in which the LBA tracts would be mined as extensions of existing mines. A maximum of about 35% of the permit areas would be removed from livestock and wildlife production at any one time due to mining; grazing restrictions prior to mining and during reclamation would increase this to as much as 100% of the LBA areas. 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 premining levels within several years following reclamation. Wildlife use of the area will 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 with USFS input). The majority of the approved species are native to the LBA tracts. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. At least 20% of the area will be reclaimed to native shrubs at a density of one per square meter as required by current

regulations. Estimates for the time it would take to restore shrubs to premining density levels range from 20 to 100 years. An indirect impact of decreased big game habitat carrying capacity could be associated with this vegetative change. Within about 10 years following reclamation, a diverse, productive, and permanent vegetative cover would be established on the proposed lease lands. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Reclaimed areas at the Jacobs Ranch Mine, mined within the last decade, have already been declared crucial elk habitat by WGFD (1994). In areas of the LBA tracts where surface ownership is private (see Figures 3-14 and 3-15), the private landowners would have the right to manipulate the vegetation on their lands as they desire once the reclamation bond is released.

About 350 acres of surface disturbance per year of mining would occur on the Powder River LBA Tract at the proposed rates of production and 240 acres of surface disturbance would occur per year of mining on the Thundercloud LBA Tract regardless of which action alternative is selected. By the time mining ceases, over 70% of these disturbed lands will have been reseeded. The remaining 30% will be reseeded during the following 2 to 3 years as the life-of-mine facilities areas are reclaimed.

The reclamation plans for each LBA tract would also include steps to control invasion by weedy 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 during the drought years, 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 re-establishment of vegetation patterns on the reclaimed areas to some extent. The postmining maximum slope would be 20% in accordance with WDEQ policy. The average reclaimed slope will not be known until WDEQ's technical review of the permit revision applications is complete. However, since both LBA areas are fairly flat, no significant changes in average slope are predicted.

Following reclamation, the LBA tracts would be primarily mixed prairie grasslands with graminoid/forb-dominated areas, and the overall species diversity would be reduced, especially for the shrub component. The amount of playa grassland to be restored will be determined at the permit revision stage. Current WDEQ policy is that postmining depressions be similar to premining depressions in location, number, drainage area ($\pm 10\%$) and storage capacity ($\pm 25\%$) (WDEQ/LQD 1996). Playas with wetland characteristics will fall under the jurisdiction of the COE. Detailed wetland mitigation plans would be developed at the permitting stage to ensure no net loss of wetlands on the project area.

The decrease in plant diversity would not seriously affect productivity of the reclaimed areas, regardless of the alternative selected, and the proposed postmining land use (wildlife habitat and rangeland) would be achieved even with the changes in vegetative species composition and diversity.

4.1.9 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 include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

These impacts are currently occurring on the existing leases as mining occurs; if the LBA tracts are leased under the Proposed Action or Alternative 2, the area of mining disturbance would be extended onto the LBA tracts and mining would be extended by up to 11.1 years.

4.0 Environmental Consequences

Under the Proposed Action or Alternative 2, big game would be displaced from portions of the LBA tracts to adjacent ranges during mining. Pronghorn would be most affected; however there is no crucial pronghorn habitat on either of the LBA tracts. Mule deer, elk and white-tailed deer use these lands infrequently. The displacement would be incremental, occurring over several years and allowing for gradual changes in big game 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 the existing leases, 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 two tracts, 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.

Road kills related to mine traffic would be extended in the area by up to 11.1 years.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the LBA tracts. Sagebrush would gradually become re-established on the reclaimed land, but the topographic changes would be permanent.

Direct losses to small mammals would be higher than for other wildlife since the mobility of small mammals is limited and many would retreat into burrows when disturbed. Mammals such as coyotes, rabbits, etc., would be temporarily displaced to other habitats by mining and would return following reclamation. Populations of less mobile animals (such as mice) would decline during mining. However, these animals generally have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly.

Mining of the LBA tracts would eliminate potential sage grouse habitat. However, very few sage grouse have been observed using the LBA tracts during annual wildlife monitoring surveys and specific baseline surveys completed for sage grouse.

No leks have been located within two miles of the Thundercloud LBA Tract although specific lek searches were completed in 1995 and 1996. One lek is located within 0.5 mile of the Powder River LBA Tract but only one male was observed in 1996 (Figure 3-12, Section 3.10). Annual wildlife monitoring completed for the adjacent Jacobs Ranch and Black Thunder Mines also did not reveal any leks or significant sage grouse activity in this area (Figure 3-13, Section 3.10). Additional surveys revealed that sage grouse use of this area was very restricted. Based on these inventories, sage grouse use of both LBA tracts is very limited, so impacts would be minor.

Raptor populations would not be adversely affected by mining either tract, but individual nesting pairs and birds will be impacted. In 1995 and 1996 only two raptor species, the Swainson's hawk and ferruginous hawk, were recorded nesting on or adjacent to the Thundercloud LBA tract. Nests for these two species will be destroyed or impacted by

mining. A total of five raptor species were recorded on or adjacent to the Powder River LBA Tract in 1995 and 1996. These species include the golden eagle, ferruginous hawk, red-tailed hawk, Swainson's hawk, great horned owl and short-eared owl, and they will most likely be impacted by mining this tract. If the LBA tracts are leased, a raptor mitigation plan would have to be prepared and approved as part of a revised mining plan for each tract prior to mining. The raptor mitigation plans would be subject to USFWS review and approval before the mining plan is approved. Any nests that would be impacted by mining operations would have to be relocated in accordance with that plan. Prior to the disturbance of any raptor nest, special purpose permits would have to be secured from the USFWS and WGFD. All active raptor nests within the mine permit area would be protected further by buffer zones. Mine-related disturbances are not allowed to encroach in the near vicinity of any active raptor nest from March until hatching, and disturbances near raptor nests containing nestlings is strictly limited to prevent danger to, or abandonment of, the young. These required mitigation measures are part of the action alternatives.

Foraging habitat for raptors would be reduced until revegetation successfully attracts small mammals, which serve as their prey. The following required measures (which are part of the action alternatives) would also ensure that site-specific impacts would be minimized: All power lines would be made raptor safe (Avian Power Line Interaction Committee 1994), and successful revegetation would support substantial rodent (prey) populations.

Annual monitoring by other area mines has not documented any apparent declines in area eagle or hawk populations due to mining activities. Raptor sitings are common;

however, reproductive rates are presently depressed in the area according to monitoring conducted by the WGFD, the BLM, and the USFS, and populations may be decreasing.

Mountain plovers have not been recorded on the Thundercloud LBA Tract or within two miles. This species has not been recorded on the Powder River LBA Tract but was recorded within one mile of that area. The required surveys would be completed if potential habitats within each LBA tract are to be disturbed. Mountain plover surveys, conducted in accordance with USFWS guidelines, would be required as part of the WDEQ permitting process. If plover habitat is identified on these lands, a habitat recovery and replacement plan would be required as part of the mine permit application. This plan, which would have to be approved by the USFWS, would be expected to reduce potential impacts to an acceptable level.

No other migratory birds of high federal interest (MBHFI) regularly use the LBA tracts, and raptors are the only MBHFI that breed in the area (see Section 3.10). Therefore, mining would have negligible impacts on these species.

Disturbance of stock ponds on the LBA tracts would impact waterfowl which utilize the ponds for resting and feeding during migration. The creation of sedimentation ponds, which is required, would partially mitigate this impact. WDEQ and the COE would also require creation of wetlands during reclamation which would minimize impacts. The LBA tracts currently have limited value for waterfowl production.

Resident songbirds would have to compete for available adjacent territories and resources as their habitats are disturbed by mining operations. Where adjacent habitat is

4.0 Environmental Consequences

at carrying capacity, this competition would result in some mortality. Losses would be higher when habitat disturbance coincides with incubation and rearing of young. These effects would be short-term for grassland species but would last longer for shrub-dependent species. Several required measures would minimize these impacts. A diverse seed mixture with shrub groupings would provide food, cover, and edge effect, and tree plantings would produce perching and nesting sites.

USFS Region 2 sensitive species habitat may be directly or indirectly impacted by changing the surface character of the LBA tracts. Potential impacts may be either short-term (until reclamation) or long-term (persisting beyond successful completion of reclamation). If the LBA tracts are leased, the USFS will evaluate the tracts for these sensitive species in a Biological Evaluation prior to any habitat manipulation actions when the lessee files an application for a surface mining permit revision.

The impacts discussed above would apply to the original lease applications and proposed alternatives.

4.1.10 Threatened, Endangered, and Candidate Species

Mining the LBA tracts under the Proposed Action and Alternative 2 would not be expected to jeopardize the existence of any T&E species. No known critical habitat for T&E species exists on either LBA tract.

There are no prairie dog colonies on the LBA tracts, and surveys of nearby towns have produced no evidence of black-footed ferrets. Bald eagles could potentially nest or roost on the LBA tracts; however, there are no concentrated food sources for eagles on the LBA tracts and the loss of any potential prey

habitat would be short-term. Peregrine falcon nesting habitat does not exist on either LBA tract, and there are no concentrated food sources for peregrines on the LBA tracts. In surveys completed in 1997, no Ute Ladies' Tresses orchids were found on the Powder River LBA Tract. Suitable habitat for Ute Ladies' Tresses orchid is not potentially present on the Thundercloud LBA Tract and no Ute Ladies' Tresses orchids have been found in surveys of that area. If any plants are found, development of a USFWS-approved mitigation plan would be required prior to mining. Mountain plover habitat may potentially occur on the LBA tracts, but no plovers have been documented. Surveys for plovers would be required prior to any mining activity and if any plovers are found, development of a USFWS-approved mitigation plan would be required prior to mining. No recent sightings of swift fox have been reported on or near the LBA tracts; however, much of the PRB is potential swift fox habitat.

4.1.11 Land Use and Recreation

The major adverse environmental consequences of the Proposed Action or Alternative 2 on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of oil and gas development on about 8,375 acres (Proposed Action) or about 8,503 acres (Alternative 2) during active mining. Wildlife (particularly big game) and livestock (cattle and sheep) use would be displaced while the tract is being mined and reclaimed. In addition, federally-owned surface on the two tracts would not be available for recreation during mining.

If some or all of the currently producing oil and gas wells on either tract are still producing at the time that coal removal begins, it would be necessary to remove the equipment associated with those wells and to

mine through those wells to recover all of the coal. Before this could occur, the coal lessee and the oil and gas well operator would have to negotiate a mutually acceptable agreement regarding the value of the unrecovered oil and gas resources and/or the cost of re-establishing production after mining and reclamation. New drilling would not be possible in areas of active mining, but could take place in areas not being mined or in reclaimed areas. Any coal bed methane resources on the LBA tracts would be lost when the coal is removed.

Hunting on the LBA tracts would be eliminated during mining and reclamation. Pronghorn, mule deer, and white-tailed deer occur on and adjacent to both tracts. Sage grouse, mourning dove, waterfowl, cottontail rabbit, and coyote also inhabit these tracts. Mining the Powder River LBA Tract would remove public access to approximately 2,675 acres of federal land in pronghorn Hunt Area 27 and mule deer Hunt Area 21. Mining the Thundercloud LBA Tract would remove public access to approximately 1,240 acres of federal land located in pronghorn Hunt Area 24 and mule deer Hunt Area 21. Following reclamation, the land would be suitable for grazing and wildlife use, which are the historic land uses. Following reclamation bond release, management of the privately-owned surface would revert to the private surface owner and management of the federally-owned surface would revert to the federal surface managing agency (USFS).

4.1.12 Cultural Resources

Cultural resources will be impacted by mining, but adverse impacts will be mitigated through data recovery and/or avoidance of significant properties. A Class III survey has been completed on the Powder River LBA Tract, and 45 prehistoric and historic sites have been recorded. A Class III survey has

also been completed on the Thundercloud LBA Tract. Forty-two sites were located by the inventory. Three to six sites at the Powder River LBA Tract require further work to determine their significance. One site at the Thundercloud LBA Tract is considered eligible for nomination to the NRHP. Wyoming SHPO must concur with the evaluations of both tracts before any disturbance can occur.

Impacts to eligible or unevaluated cultural resources cannot be permitted. 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.

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.

4.1.13 Native American Concerns

No sites of Native American religious or cultural importance are known to occur on the LBA tracts. If such sites or localities are identified at a later date, they will be taken into consideration.

4.1.14 Paleontological Resources

No unique or significant paleontological resources have been identified on the LBA tracts, and the likelihood of encountering significant paleontological resources is small. Lease and permit conditions require that should previously unknown, potentially significant paleontological sites be discovered, work in that area shall stop and

4.0 Environmental Consequences

measures will be taken to assess and protect the site (see Appendix D).

4.1.15 Visual Resources

Visual impacts would be evident during mining. Mining activities on the Powder River LBA tract and most of the Thundercloud LBA tract would not be visible from any major travel routes, and would be partly concealed by surrounding terrain. Mining of some parts of the Thundercloud LBA tract would be visible from State Highway 450.

Mining would affect landscapes classified by USFS as "common," and the landscape character would not be significantly changed following reclamation. After reclamation, reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) than undisturbed terrain to the north and west, and sagebrush would not be as abundant for several years; however, within a few years after reclamation, the mined land would be distinguishable from the surrounding undisturbed terrain only to somebody very familiar with landforms and vegetation.

4.1.16 Noise

Noise levels on the LBA tracts would be increased considerably by mining activities such as blasting, loading, hauling, and possibly in-pit crushing. Since both LBA tracts would be mined as extensions of existing operations under the action alternatives, no rail car loading would take place on the LBA tracts. The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 A-weighted decibels (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. Since the nearest occupied dwelling is at least 4,000 ft away from either LBA tract, there should be no significant noise impacts.

Because of the remoteness of the sites and because mining is already ongoing in the area, noise would have little off-site effect. Wildlife in the immediate vicinity of mining may be adversely affected; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to increased noise associated with active coal mining. After reclamation is completed, noise would return to premining levels.

4.1.17 Transportation Facilities

No new or reconstructed transportation facilities will be required under the Proposed Action or Alternative 2. Essentially all of the coal mined on the LBA tracts would be transported by rail. Leasing the LBA tracts would extend the length of time that coal is shipped from the permitted Jacobs Ranch and North Antelope/Rochelle Mines. Active pipelines currently cross both LBA tracts, and any relocation of pipelines and utility lines would be handled according to specific agreements between the coal lessee and the pipeline owner if the need arises. 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, and Union Pacific have upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected from the southern PRB with or without the leasing of the proposed LBA tracts.

4.1.18 Socioeconomics

Leasing and subsequent mining of the LBA tracts would extend the life of the already permitted Jacobs Ranch Mine by 11 to 11.1 years and the North Antelope/Rochelle Mines by 7.5 to 7.8 years. Leasing and mining the LBA tracts as production maintenance tracts would alter current employment levels in order to keep pace with currently permitted production increases. Over the revised mine life, employment levels would increase by about 45 persons at the Jacobs Ranch Mine and about 220 persons at the North Antelope/Rochelle Mines.

Coal prices are projected to remain relatively constant throughout the lives of the mines (WSGS 1997), and the total direct fiscal benefit to the State of Wyoming from coal mining (taxes and royalties) has been estimated at \$1.10/ton of coal mined (University of Wyoming 1994). Under the Proposed Action, the mining of 384 million tons of coal from the Thundercloud LBA Tract and 489 million tons of coal from the Powder River LBA Tract would generate a combined total of \$960 million to the state. Under Alternative 2, the mining of 894 million tons from the two tracts would generate \$983 million in state revenues. Assuming a price of \$4.00 per ton, the combined sales of the recoverable coal from both LBA tracts would total \$3.49 billion for the Proposed Action and \$3.58 billion for Alternative 2. Estimated economic multipliers for determining the total economic impact to the local area (i.e., direct, indirect, and induced effects) range from 1.473

(University of Wyoming 1994) to 1.796 (Campbell County Economic Development Corporation 1993). Applying an average economic multiplier of 1.5 to these revenues, the total economic impact from leasing and subsequent mining of the LBA tracts would be about \$5.24 billion (Proposed Action) to \$5.37 billion (Alternative 2). These economic impacts would benefit the local and regional economies.

The federal government receives income from leased coal in the form of a lease bonus payment and royalties on production. Bonus payments are subject to competitive bid and have ranged from 11.1 cents/ton to 29.1 cents/ton on the LBA's sold to date (see Table 1-1). For the Powder River and Thundercloud LBA tracts, this suggests a bonus payment in the range of \$104 million to \$281 million. Federal royalties are 12.5% of the sales price of the coal. For a sales price of \$4 per ton and a net production from the LBA tracts of 873 million to 894 million tons, the royalty payments would total \$436.5 million to \$447 million over the period of coal removal from the tracts. Both bonuses and royalty payments are divided equally between the state and federal governments.

If the LBA tracts are leased under the action alternatives and coal production increases as projected, total employment at the Jacobs Ranch and North Antelope/Rochelle Mines would increase by up to 265 employees. These increased employment levels would occur over the extended mine lives of up to 11.1 years at Jacobs Ranch and 7.8 years at North Antelope/Rochelle. The increase in employment of 265 persons represents just over 1% of the 25,200 persons in the May 1997 labor force in Campbell and Converse Counties (Wyoming Employment Resources Division, July 1997). Considering that the May 1997 unemployment in these counties

was 1,198 and that the unemployment rate rose from 4.4% to 4.8% between May 1996 and May 1997, it appears that the labor force could absorb the projected increase in employment. These employees will live in Gillette, Douglas, Wright or Newcastle, and those communities would benefit by having these residents maintain their jobs for these additional years.

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 and Alternatives 1 or 2 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 general 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.

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.

4.1.19 Hazardous and Solid Waste

Solid waste which may be produced by mining the LBA tracts consists of floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and

office and food wastes. Wastes of this type are currently being generated at the existing operations adjacent to both of the LBA tracts. The Jacobs Ranch, North Antelope and Rochelle Mines dispose of solid wastes within their permit boundaries in accordance with WDEQ-approved solid waste disposal plans. Sewage generated by mining the LBA tracts would be handled by existing WDEQ-permitted sewage systems currently present on the existing mine facilities. Maintenance and lubrication of most of the equipment used to mine the two LBA tracts would take place at existing shop facilities at the Jacobs Ranch, North Antelope, and Rochelle Mines. Major lubrication, oil changes, etc., of most equipment would be performed inside the service building lube bays, where waste oil is currently contained and deposited in storage tanks. The collected waste oils are then recycled offsite.

KMCC and PRCC have 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 proposed for use in mining the LBA tracts. Both companies 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 at their respective properties.

KMCC and PRCC are responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of mining the LBA tracts would be 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.

KMCC and PRCC also 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, are 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 also 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.

4.2 No-Action Alternative

Under the No-Action Alternative, these coal lease applications would be rejected and the areas contained in the application would not be offered for lease at this time. For the purposes of this analysis, the No-Action Alternative assumes that these lands would never be mined. However, the approved mining operations for the existing Jacobs Ranch, North Antelope and Rochelle mines would not be changed if this alternative is chosen. 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, USFS Region 2 sensitive species, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Jacobs Ranch, North Antelope and Rochelle coal leases under the No-Action Alternative, but these impacts would not be extended onto the LBA tracts.

The general nature and magnitude of cumulative impacts as summarized in Table 2.5, which would occur from implementation of the Proposed Action or Alternative 2, would not be substantially different under the No-Action Alternative. However, coal removal and the associated disturbance and

impact would not occur on the 8,375 to 8,503 additional acres disturbed in the Proposed Action or Alternative 2, respectively. The economic benefits that would be derived from mining the LBA tracts during an additional 7.5 to 11.5 years of mining would be lost. Without the LBA tracts, operations at Jacobs Ranch Mine would end in about 2007, and at North Antelope/Rochelle Mines operations would end in 2012, when the existing leases are mined out. Not leasing these delineated suitable tracts at this time may also result in a bypass of this federal coal if the leases are not sold while the existing mines are still in operation and pits are in a position to expand into the LBA areas.

4.3 Regulatory Compliance, Mitigation, and Monitoring

In the case of surface coal mining, SMCRA and state law require a considerable amount of mitigation and monitoring. Mitigation and monitoring measures that are required by regulation are considered part of the action alternatives. To illustrate the types of mitigation and monitoring measures that are required by SMCRA and state law, some of these required measures are mentioned in the resource discussions in the previous section and in this section.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, then BLM or USFS can include additional mitigation measures as stipulations on the new lease. No mitigation or monitoring measures beyond those required by SMCRA or state law have been identified as necessary for the Powder River or Thundercloud tracts at this time.

4.3.1 Topography and Physiography

Given the WDEQ-mandated requirement to restore the postmining topography to the

approximate original contour or an approved equivalent, no additional mitigation measures are recommended to address potentially adverse impacts.

4.3.2 Geology and Minerals

A WDEQ/LQD permit application requirement includes a drilling and sampling program to determine overburden geochemistry and reclamation suitability. If unsuitable overburden is present, the applicant will be required to design the mine and reclamation plan to minimize any adverse impacts. These measures typically include mixing and/or selective placement of spoil. No additional mitigation measures are recommended.

4.3.3 Soils

Selective placement of at least 4 ft of suitable overburden on the graded spoil surface prior to replacing topsoil is assumed. With an anticipated 18 inches of suitable topsoil placed on both LBA tracts, the top 5.5 ft of regraded surface material would meet WDEQ suitability guidelines for vegetation root zones. Monitoring of revegetation growth with corresponding application of appropriate soil amendments would ensure successful reclamation. These measures are required and are thus part of the action alternatives. No additional mitigation or monitoring will be needed.

4.3.4 Air Quality

Current air quality regulations and regulatory practices are designed for, and have been historically demonstrated to be effective in protecting ambient air from degradation from air pollutants generated by surface mining. Before the LBA tracts could be mined, even as an extension of approved operating permits, the existing air quality permits must be amended and approved by WDEQ/AQD. The required modeling is expected to verify

the previous analysis because there are no proposed changes in mining methods or rates under either action alternative.

The mitigation of impacts to air quality would be achieved through a combination of five regulatory activities: 1) dispersion modeling of mine plans for annual average particulate pollution impacts on ambient air; 2) use of particulate pollution control technologies; 3) use of specific work practices to minimize windborne fugitive particulate emissions; 4) on-site air quality monitoring to demonstrate compliance with ambient air quality standards; and 5) on-site compliance inspections of mining activities by state regulatory inspectors. Surface mines must comply with all five aspects of modeling, pollution control, pollution prevention, monitoring, and compliance inspection as conditions for obtaining and maintaining an air quality operating permit.

Potential air pollution is further mitigated at the source by the requirement that facilities utilize EPA- and state-mandated Best Available Control Technology (BACT). In the case of surface coal mining, BACT involves the use of fabric filtration or wet scrubbing of coal storage silo and conveyor vents to mitigate generation of particulates in ambient air. WDEQ also specifies certain other methods for mitigating windborne fugitive emissions of particulates, including watering or chemical dust suppression of haul roads and exposed soils, containment of truck dumps and primary crushers, covering of conveyors, and prompt revegetation of exposed soil. Such measures are estimated to be 50-60% effective in mitigating windborne fugitive particulate emissions from roads and exposed land (WDEQ 1979). These are regulatory requirements and are therefore considered part of the Proposed Action and Alternative 2.

WDEQ has also instituted local ambient air quality monitoring as a requirement for obtaining an air quality permit. Each mine in the PRB is required to install, maintain, and operate a certified ambient (off-site) monitor for PM₁₀ or TSP as a surrogate for PM₁₀, and to submit monitoring data to WDEQ as a measure of compliance with ambient air quality standards. Specific compliance with both air quality regulations and operating permit requirements is further assured through the mine site inspection activities conducted by WDEQ.

No additional mitigation measures have been identified as necessary.

4.3.5 Water Resources

The cumulative hydrologic impacts associated with mining the LBA tracts would be evaluated by the WDEQ based on site-specific data before the tracts could be mined. Detailed mitigation plans would be developed at that time.

SMCRA and Wyoming State law obligate the coal mine operator 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 measure should adequately minimize potential impacts occurring to groundwater resources. WDEQ-required sedimentation ponds would continue to adequately mitigate surface water impacts. Extensive surface and groundwater monitoring would also be required as part of the mine permitting procedures. Since these measures are required by state and federal law, they are considered part of the Proposed Action and Alternative 2. No additional mitigation or monitoring measures have been identified.

4.3.6 Alluvial Valley Floors

A detailed study to identify alluvial valley floors is required by WDEQ prior to mine permitting. If any alluvial valley floors are identified, a detailed mitigation plan would be developed at that time. This plan would be designed to protect downstream alluvial valley floors during mining and restore essential hydrologic functions of any alluvial valley floors directly affected by mining. No additional mitigation or monitoring measures have been identified.

4.3.7 Wetlands

A detailed study to identify jurisdictional wetlands is required by the COE prior to mine permitting. If any jurisdictional wetlands are identified, a detailed mitigation plan will be developed at that time. The mitigation plan would include developing replacement plans for wetlands in the approved reclamation plan. No additional mitigation or monitoring measures have been identified.

4.3.8 Vegetation

Detailed reclamation plans, including a comprehensive revegetation plan, would be approved by WDEQ prior to mining. The revegetation plan would identify the permanent reclamation seed mixtures that would be used. The permanent reclamation seed mixtures, which must be approved by WDEQ, consist predominantly of species native to the area.

On reclaimed areas, levels of erosion and invasion by undesirable plant species are typically higher than premining levels prior to the successful establishment of the desired species. The reclamation plans would include specific measures to minimize erosion on reclaimed areas (e.g., mulching and the use

of cover crops). Weed infestation would be chemically and mechanically controlled.

Vegetation on reclaimed land is generally less diverse than vegetation in undisturbed areas, and the reduction in topographic diversity further decreases the potential for vegetative diversity. Mitigation measures that may be used to increase vegetative diversity include using a diverse reclamation seed mixture, direct hauling of topsoil, selective planting of shrubs in riparian areas, planting of sagebrush, creation of depressions and rock piles, and special planting procedures around rock piles.

WDEQ also requires posting of a reclamation performance bond. This bond is held for a minimum of 10 years after seeding to assure that the reclamation meets all requirements and is self-sustaining. No additional mitigation measures have been identified.

4.3.9 Wildlife

Numerous mitigation measures are required by federal and state statutes to be incorporated into the mining and reclamation plans to minimize wildlife impacts. Required mitigation measures are considered to be part of the action alternatives. These measures generally include: 1) restoring the premining topography to the maximum extent possible; 2) planting a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife; 3) designing fences to permit wildlife passage; 4) raptor-proofing power transmission poles; 5) creating artificial raptor nest sites; 6) placing rock clusters and creating shallow depressions to add topographic diversity in reclamation; 7) reducing vehicle speed limits to minimize wildlife mortality; and 8) instructing employees not to harass or disturb wildlife.

The permittees would also be required to prepare a raptor mitigation plan, which must be reviewed by the USFWS. Additionally, the mining operations are required to conduct extensive wildlife monitoring surveys, both before and during mining. No additional mitigation or monitoring measures have been identified.

4.3.10 Threatened, Endangered, and Candidate Species

The required mitigation and monitoring practices described above would ensure protection of any previously unreported T&E species. USFWS-approved surveys would be conducted for Ute ladies' tresses and mountain plovers prior to surface-disturbing activities. If prairie dogs invade the LBA tracts, ferret searches would be conducted prior to surface disturbance. The results of such surveys would be reviewed by USFWS and by the USFS on affected federal surface before mining could proceed. Employees would be instructed to avoid disturbing bald eagles, and revegetation would restore the disturbed foraging areas for their prey. All power lines would be made raptor safe. These measures are required by state or federal law and are therefore considered part of the action alternatives. No additional mitigation or monitoring measures have been identified at this time.

4.3.11 Land Use and Recreation

Since the majority of the land within the Powder River LBA Tract is public, access to this land will be restricted if the land is amended to the North Antelope/Rochelle Permit Boundaries. Since 1993, PRCC and the USFS have participated in a partnership in which PRCC has agreed to finance and contract for portions of or all of the necessary inventories and reports required to accomplish land exchanges in return for a

commensurate reduction in annual Special Use Permit fees.

This partnership allows the USFS to exchange certain lands with private landowners to improve the scattered landownership pattern and provide additional wildlife habitat, public recreational opportunities and other public benefits. This partnership provides for mitigation of the temporary reduction of lands available for public recreation due to PRCC's mining operations. No additional mitigation or monitoring measures have been identified.

4.3.12 Cultural Resources

Direct impacts to cultural resources would be mitigated following procedures specified in 36 CFR 800. As part of the permitting process, Class I and Class III inventories would be conducted on all state and federal lands and on private lands affected by federal undertakings. All resources identified in these surveys would be evaluated for eligibility to the NRHP in consultation with SHPO. Eligible or listed sites identified would be avoided, as would areas with high potential for significant cultural deposits. If any NRHP (eligible or listed) historic or prehistoric sites found within the area cannot be avoided, a data recovery program would be implemented. Mining activities would be monitored by an archaeologist qualified by the appropriate federal agency on federal lands or by OSM or WDEQ on private lands. If historic or prehistoric materials are discovered during mining operations, appropriate BLM and USFS personnel would be notified immediately (see Appendix D). These required measures are part of the action alternatives.

Potential impacts to cultural resources would be reduced through informing all personnel of the importance of the resources and the

regulatory obligations to protect such resources. All personnel would be instructed that collection of cultural materials on public lands is prohibited. No additional mitigation or monitoring measures have been identified.

4.3.13 Native American Concerns

No mitigation measures are recommended, beyond what is currently required by state and federal law.

4.3.14 Paleontological Resources

No mitigation measures are recommended, beyond what is required by state and federal law. If potentially significant paleontological resources are discovered during surface-disturbing activities, those activities will be suspended and the resource will be evaluated (Appendix D). No additional mitigation or monitoring measures have been identified.

4.3.15 Visual Resources

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.16 Noise

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.17 Transportation Facilities

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.18 Socioeconomics

No mitigation measures are recommended, beyond what is required by state and federal law.

4.4 Residual Impacts

Residual impacts are unavoidable impacts that cannot be mitigated and would therefore remain following mining and reclamation.

4.4.1 Topography and Physiography

Topographic moderation is a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

4.4.2 Geology and Minerals

Geology from the base of the coal to the surface would be subject to significant, permanent change.

4.4.3 Soils

Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alteration of soil characteristics.

4.4.4 Air Quality

No residual impacts to air quality would occur following mining.

4.4.5 Water Resources

The area where groundwater drawdowns and replacement of coal and overburden with spoils occur would be increased under the action alternatives compared to what would occur without the addition of these LBA tracts. The postmining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time will be required near the mining boundaries. Water level and water quality in the backfill will be suitable to provide water to wells for

livestock use, but will be different from premining conditions.

4.4.6 Alluvial Valley Floors

No residual impacts to alluvial valley floors would occur following mining.

4.4.7 Wetlands

No residual impacts to wetlands would occur following mining.

4.4.8 Vegetation

Reclaimed vegetative communities may never completely match the surrounding native plant community.

4.4.9 Wildlife

Although the LBA tracts would be reclaimed to be as near original condition as possible, 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.

4.4.10 Threatened, Endangered, and Candidate Species

No residual impacts to T&E or candidate species are expected.

4.4.11 Land Use and Recreation

No residual impacts to land use and recreation are expected.

4.4.12 Cultural Resources

Even with well-organized mitigation plans and associated procedures, impacts are

unavoidable. It is neither possible nor practicable to mitigate all sites; thus, unmitigated sites will be permanently lost.

4.4.13 Native American Concerns

No residual impacts to Native American concerns are expected.

4.4.14 Paleontological Resources

No residual impacts to significant paleontological resources are expected.

4.4.15 Visual Resources

No residual impacts to visual resources are expected.

4.4.16 Noise

No residual impacts to noise are expected.

4.4.17 Transportation Facilities

No residual impacts to transportation facilities are expected.

4.4.18 Socioeconomics

No residual impacts to socioeconomics are expected.

4.5 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

4.0 Environmental Consequences

result of existing development in the area being mined and considers how those impacts would change if the LBA tracts are leased and mined and if other proposed development in the area occurs.

Important points to keep in mind include: 1) the total areas of all mines 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 each permit area (depending on saturation, how close the next mine pit is, etc.); and 4) the intensity and extent of coal bed methane development is highly speculative.

Since decertification of the Powder River Federal Coal Region in 1990, the Wyoming State Office of the BLM has held ten competitive coal lease sales and sold seven federal coal leases containing approximately 1.42 billion tons of coal using the lease-by-application (LBA) process (Table 1-1). This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office.

The Wyoming BLM has received applications for five additional federal coal tracts containing approximately 2.0 billion tons of coal (Table 1-2). The Powder River Regional Coal Team (PRRCT) has reviewed all of these applications and has recommended processing four of them. At a public meeting held in Casper, Wyoming on April 23, 1997, the PRRCT recommended that the BLM not process the New Keeline lease application for a potential new mine start at this time. The BLM Wyoming State Director subsequently rejected that application without prejudice in a decision signed on June 13, 1997. This decision has been appealed. The four pending LBA's

recommended for processing include approximately 1.3 billion tons of mineable federal coal.

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996. The purpose of this study was to document actual mineral development impacts in the PRB from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared PRB regional EIS's. The status check was updated prior to the 1997 PRRCT public meeting in Casper.

Four of the previously prepared regional EIS's evaluated coal development in the PRB in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Coal Basin of Wyoming, BLM, October 1974;

Final Environmental Statement, Eastern Powder River Coal, BLM, March 1979;

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

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

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*" (Martin, et al., 1988), which is frequently referred to as "the CHIA."

In 1996, Wyoming produced approximately 278.4 million tons of coal, according to the records of the Wyoming State Inspector of Mines. This is almost a three-fold increase since 1980, when 94 million tons of coal was produced in the state. The increasing state production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97% of Wyoming's coal sales.

There are currently 17 operating coal mines in Campbell and northern Converse counties (Figure 4-1). They are located just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth. These mines produce 85% to 95% of the coal produced in Wyoming each year. Table 4-2 summarizes predicted and actual Wyoming PRB coal production and related activity. The increasing production will probably result in a continuing demand for federal coal in the Wyoming Powder River Basin, as discussed in the coal leasing demand study that was completed by the BLM Wyoming State Office in 1996 (BLM 1996e). However, several mines have announced plans to decrease coal production at this time due to the low coal prices.

Oil production has decreased in the Wyoming PRB since 1990. In recent years, more wells have been plugged annually than have been drilled.

Natural gas production in the Wyoming PRB has increased since 1990. The increase is primarily due to the development of shallow coal bed methane resources in the area just west of the coal mines, which was not anticipated in the regional EIS's. Since 1992, five EA's and one EIS have been prepared to analyze the impacts of coal bed methane development projects in the PRB. About half of the oil and gas rights in the

area of current coal bed methane development interest are federal; the remainder are private and state. Coal bed methane wells can be drilled on private and state oil and gas leases after approval by the Wyoming Oil and Gas Conservation Commission and the Wyoming State Engineer's Office. Wells cannot be drilled on federal oil and gas leases until the BLM analyzes the individual and cumulative environmental impacts of that drilling, as required by NEPA.

Other mineral development levels in the Wyoming PRB are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently three *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. Uranium production has been increasing since 1990. The increase is partially due to higher uranium prices, particularly in 1996 and 1997.

Scoria is quarried for use as road surfacing material, primarily by coal mines but also by a few excavation and construction firms. Bentonite is mined in parts of the Wyoming Powder River Basin, but not in Campbell or Converse Counties.

The proposed Thundercloud and Powder River LBA Tracts are situated within a nearly continuous corridor of six coal mines in southern Campbell and northern Converse Counties, Wyoming. This southern corridor is approximately 24 miles long and 8 miles wide (see Figure 3-1). Five maintenance leases including approximately 10,300 acres of federal coal (Jacobs Ranch, West Black Thunder, North Antelope/Rochelle, Antelope

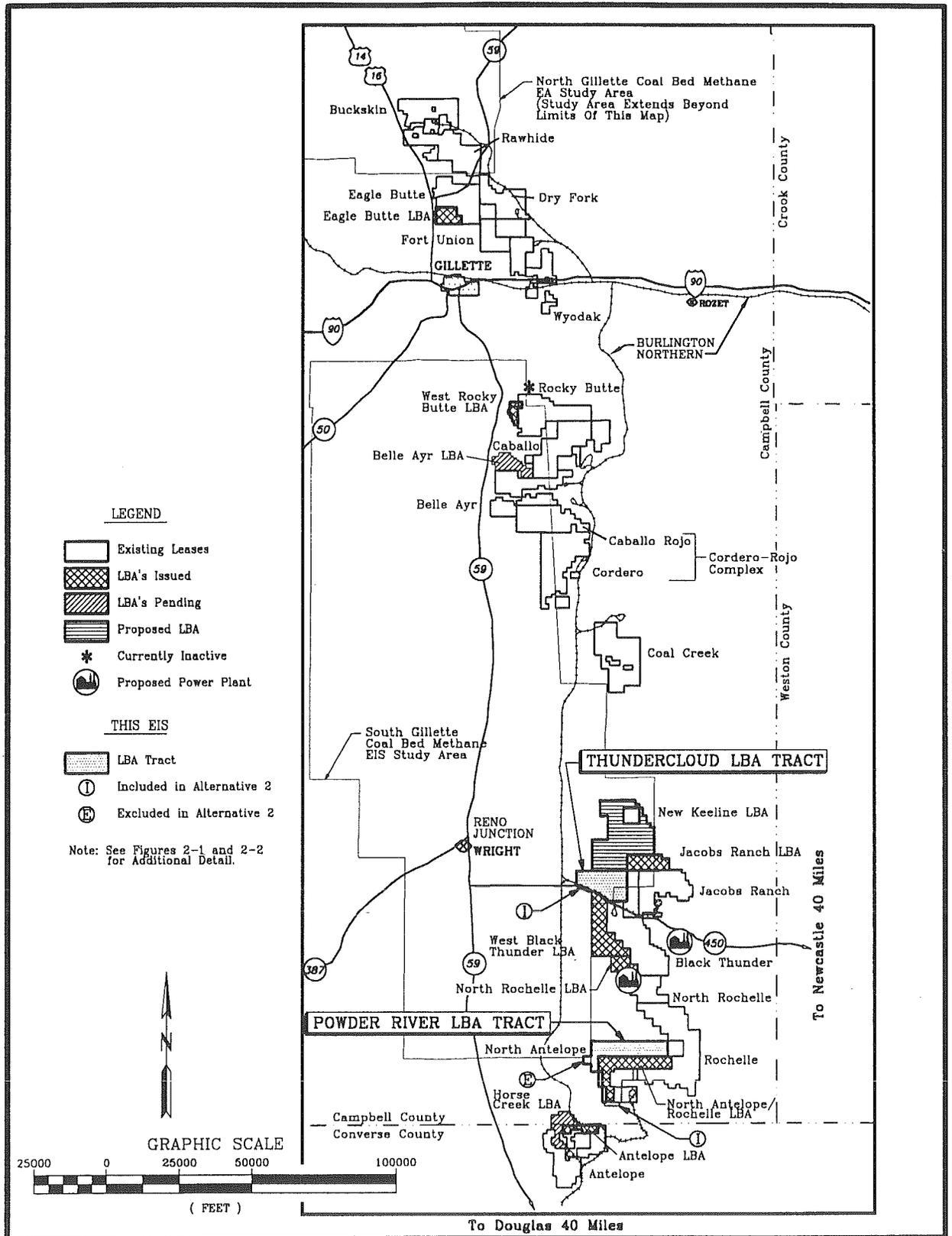


Figure 4-1. Existing and Proposed Federal Coal Leases.

and North Rochelle) have been issued to mines in this southern group since decertification, which has resulted in a 39% increase in the acres of leased federal coal in this group of mines since 1990 (Figure 4-1). There are three pending maintenance leases including approximately 8,900 acres of federal coal in this group of mines and LBA tracts (Thundercloud, Powder River and Horse Creek). Issuance of the Thundercloud and Powder River LBA Tracts under either action alternative would represent an increase of about 15% in acreage of leased federal coal in the southern group of mines. The New Keeline LBA, which represents a potential new mine start, is located north of and adjacent to the Jacobs Ranch Mine (Figure 4-1). As stated previously, the Wyoming State Director has rejected this application. There is also a potential for development of coal bed methane resources in a large area west of the coal mines. Two methane project areas are shown on Figure 4-1; both are in production.

In addition to the ongoing coal mining, the proposed maintenance coal leasing (the Powder River and Thundercloud LBA Tracts considered in this EIS and the Horse Creek LBA Tract), and the potential coal bed methane development, there are four other projects in progress or planned in the vicinity of the southern group of mines: 1) construction of the North Rochelle Mine facilities and rail loop which began in June of 1997; 2) the ENCOAL Plant, which has been proposed within the rail loop at the North Rochelle Mine; 3) the Two Elk power plant, which has been proposed east of the Black Thunder Mine; and 4) the construction of the proposed DM&E Railroad line. The ENCOAL and Two Elk projects could commence in 1998, however, the schedule for both projects is tentative. In a recent press release (Zeigler Coal Holding Company, August 29, 1997), it was

announced that the construction contract for the plant had been terminated. The company stated its intention to "...work toward construction of a commercial plant to meet the appropriate market timing..." The DM&E Railroad currently proposes to acquire the necessary permits and start construction by 1999 and complete a new railroad line in 2001. These projects were proposed independently of the LBA tracts, and the schedules for some of these projects are uncertain. They are discussed in the cumulative impact discussion because, due to their location, the impacts related to these projects could overlap with the impacts of mining the LBA tracts.

The ENCOAL Plant could consist of three 5,500 ton/day parallel modules with an associated 240 megawatt (Mw) co-generation power plant. The power plant boiler would burn coal fines from the plant, as well as some minor purge gas streams, and would produce enough electricity to run the ENCOAL Plant and the North Rochelle Mine. Excess electricity would be available for external sale. ENCOAL has submitted a request for amendment to the North Rochelle mining permit to WDEQ/LQD, since the ENCOAL Plant would be located within the rail loop at the North Rochelle Mine. ENCOAL is also pursuing a surface land exchange with the USFS because the proposed location for the ENCOAL facilities is on USFS surface. In addition, ENCOAL has filed a Permit Amendment Application with the Industrial Siting Division of WDEQ for the proposed LFC plant, and an air quality permit application with WDEQ/AQD. Other permits that will be obtained include a wastewater permit from WDEQ, a permit for a quantity of water from the Wyoming SEO, and various construction and waste disposal permits from the state and county.

The ENCOAL operations at the North Rochelle Mine would use up to 700 gpm of water. According to plans submitted to the Wyoming State Engineer (ENCOAL 1997), ENCOAL Corporation proposes to provide required industrial water for the ENCOAL plant by means of a two-phase approach. The Phase 1 industrial water supply would be based on use of groundwater from two existing wells in a local scoria aquifer during approximately the first 8 years of plant operation. The Phase 2 industrial water supply would be based on use of groundwater from deeper aquifers during the remaining operational life of the plant if experience shows the scoria aquifer cannot continue to provide 700 gpm. The full life of the project is projected to be 30 years.

Two Elk would be a coal-fired power plant located about 3 miles northeast of the Powder River LBA Tract and 3 miles southeast of the Thundercloud LBA Tract and would generate 250 Mw. The plant would burn low-Btu "waste coal" and coal fines as well as sub-bituminous coal in a pulverized coal boiler. This ability to burn low Btu waste coal and fines would allow the Two Elk plant to recover fuel values that might otherwise be lost and thereby generate electric power more efficiently than existing coal-fired plants. Coal and waste coal would be transported from the mine to the power plant by direct truck haul on unpaved roads, and ash would be returned to the mine by enclosed, 4-wheel off-highway trucks. An application for an air quality Permit to Construct was submitted to WDEQ and was deemed administratively complete on August 5, 1997. No final decisions have been made as to how much water would be used, or where it would be obtained. Various scenarios for "wet" and "dry" operations are being evaluated at this time. Other permits that will be obtained include a wastewater permit from WDEQ

and various construction and waste disposal permits from the state and county.

The DM&E Railroad recently announced that they have selected the southern of three proposed routes. They have not yet identified a specific route, but in general, DM&E proposes to build a new rail line that would enter Wyoming west of Oral, South Dakota, generally follow along, but not necessarily in, the Cheyenne River valley, and reach the "Common Corridor" east of the Black Thunder Mine (DM&E Newsletters 2 and 3, September 17, 1997 and November 25, 1997).

The status check identified one part of the coal mining process where the actual levels of development did not agree with the predictions, and this was the number of acres reclaimed. In general, coal mine reclamation efforts have been successful in both the Wyoming and Montana portions of the basin; however, as indicated in Table 4-3, the regional EIS's assumed that reclamation would proceed at a faster pace than has actually occurred.

Table 4-3 compares the predicted total area of reclamation with the total number of acres that have been seeded with a final seed mixture as reported to WDEQ by all the mines. Reclamation is a process involving many steps; seeding with the final seed mixture happens near the end of the process. Therefore, Table 4-3 shows the area that is currently almost completely reclaimed but it does not reflect the total number of acres that are being reclaimed at this time.

At Jacobs Ranch Mine, 326 acres were disturbed in 1996 and 333 acres were seeded to the permanent vegetation species. Cumulatively through 1996, a total of 4,673 acres had been disturbed at Jacobs Ranch Mine and 2,760 acres had been reclaimed.

4.0 Environmental Consequences

Table 4-3. Predicted and Actual Coal Mine Disturbance and Reclamation, Campbell and Converse Counties, Wyoming

	Coal Mine Operational Surface Disturbance (Acres)	Permanent Coal Mining Reclamation (Acres)
1979 Prediction for 1990	22,794	12,666
1981 Prediction for 1990	48,400	34,100
Actual 1990	31,797	6,994
Actual 1994	41,064	11,328
Actual 1996	47,018	12,165
Increase Since 1990	4.8%	74%

Sources: 1979 & 1981 BLM Powder River Basin Regional EIS's, Annual Mine Reports submitted to WDEQ/LQD, 1996 BLM Coal Development Status Check, and Dwight's Energydata Inc. Database

At the North Antelope/Rochelle Mines, 360 acres were disturbed in 1996 and 173 acres were seeded to permanent vegetation species. Cumulatively through 1996, a total of 4,369 acres had been disturbed and 490 acres reclaimed at North Antelope/Rochelle Mines. Reclaimed in this context means grading, topsoiling, and seeding have been completed, but does not necessarily mean that the reclamation performance bond has been released.

Currently, WDEQ/LQD (1997) suggests to operators that only large, contiguous areas such as drainage basins be considered for bond release, with the assurance that the area will not be disturbed in the future. Because many mine plans cross a drainage basin several times during the life of mine, final reclamation of the drainage may not occur until late in the life of mine. This issue is further complicated when two operators are mining in the same drainage on different reclamation schedules, in that bond release for the first operator to mine the basin could be held until the second operator's portion of

the basin is reclaimed. Due to the uncertainties involved the process of applying for and receiving final bond release, most companies are electing to postpone the initiation of bond release until late in the life of mine.

The development of reclamation schedules for PRB mines must take into account various unique factors:

- Very thick coal seams;
- Diverse premining topography;
- Surface-mining methods using trucks and shovels combined with draglines; and
- Large-volume material movements.

These factors affect the amount of reclamation that can be accomplished at any given time.

Achievement of final postmine topography immediately following mining is not always possible. The mining plan dictates the backfill placement and timing sequence and

must take into account changing strip ratios which create material surpluses or deficits. Stockpiling, which may be required to fill final pit voids or store new pit boxcut material, affects the backfill material balance. Operating changes can also affect the backfill placement timing and sequence. Some examples included changing the pit direction to conform to lease configuration, changing plans to accommodate production growth and changes in technology or mining method. The achievement of contemporaneous reclamation is evaluated on a site-by-site basis by the WDEQ taking the mining complexities unique to each mine into account.

4.5.1 Topography and Physiography

Following surface coal mining and reclamation, topography will be modified in an elongated corridor east of and paralleling Highway 59 from just north of Gillette, Wyoming, south for about 75 miles. The topography in the PRB is characterized by relatively flat or rolling topography. After reclamation, these characteristics will be emphasized in the reclaimed area. Premining features that were more topographically unique (e.g., steeper hills and gullies, rock outcrops, etc.) will generally be smoothed. The reduction in topographic diversity may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges are generally very large and mining activities are, in general, not located in habitats defined as crucial. The overall flattening and lowering of the topography would result in increased infiltration of surface water and reduced peak flows from the drainages. These changes would not be significant because the streams typically flow from west to east across the area rather than north to south along the entire corridor. Therefore, only a small part of each stream's drainage area would be

disturbed (see Section 4.5.5). Mining the Thundercloud and Powder River LBA Tracts would increase the area of disturbance in the southern group of mines by about 22%.

4.5.2 Geology and Minerals

The PRB coal region encompasses an area of about 20,000 mi² and contains nearly 240 billion tons of sub-bituminous coal resources (BLM 1979). Campbell County has a total surface area of about 4,760 mi², of which approximately 4% is within current mine permit boundaries. Coal mining in this area disturbs about 2,000 acres annually with about 1,850 acres reclaimed annually (BLM 1996g). Mining and reclamation rates are expected to continue to increase through the year 2015, but the balance between reclamation and mining should remain about the same. A group of six mines, including Jacobs Ranch, North Antelope and Rochelle, exist in the southern portion of the PRB. Production of coal in the southern mine group began in 1977 at the Black Thunder Mine. The current maximum permitted production rate is 152 million tons per year from the six mines. An estimated 3 billion tons of leased coal were originally contained within these six mines, and additional unleased deeper coal reserves are present adjacent to these mines. Approximately 55,000 acres are contained in the existing permit boundaries and will be disturbed. This disturbance area represents approximately 9% of the analysis area (see Figure 3.1). Mining of the LBA tracts under the Proposed Action or Alternative 2 would add approximately 10,000 acres to the 55,000 acres within permit boundaries, an increase of some 18%.

In the PRB, the coal reserves currently leased represent a small percentage of the total coal reserves but a large percentage of the shallowest (hence, the most economical to

recover) reserves. Removal of this coal is an irreversible and irretrievable impact. PRB coal was used to generate electricity for the public in 19 states and Canada in 1995. The members of the public in those states benefit from the low utility rates related to the price of coal, clean 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.

4.5.3 Soils

The six existing southern mines as permitted would disturb approximately 38,000 acres throughout their combined lives (they would disturb about 1,200 acres annually during active mining). Assuming 10 years from initial disturbance to utilization of a parcel of reclaimed land by domestic livestock, approximately 14,000 acres (44% disturbed by Jacobs Ranch and North Antelope/Rochelle) would be unavailable for such use at any given time during active mining. However, the replaced topsoil would support a stable and productive native vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

4.5.4 Air Quality

According to current regulatory standards by which air quality is defined, surface mining and coal bed methane development in the PRB have not resulted in impacts to air quality that have exceeded federal or state standards.

The nearest Class I area is located approximately 80 miles east of the analysis area at Wind Cave National Park in southwestern South Dakota. No impacts on

air quality in excess of that permitted by regulation are known to have occurred in this area due to PRB mines.

WDEQ follows a modeling protocol which accounts for all mine-generated particulate air pollutants from all nearby mines (within 2 mi) 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. The protocol is restricted as a matter of state regulatory policy to evaluation of the average annual impacts with respect to the ambient standard of $< 50 \mu\text{g}/\text{m}^3 \text{PM}_{10}$. The Wyoming air quality standard is $50 \mu\text{g}/\text{m}^3$; however, the modeled scenarios allow for $15 \mu\text{g}/\text{m}^3$ background concentrations. Therefore, in order to remain in compliance, modeled PM_{10} concentrations should not exceed $35 \mu\text{g}/\text{m}^3$ at the permit boundary. If the LBA tracts are leased under the Proposed Action or Alternative 2, WDEQ would require that ambient air quality modeling be conducted that would consider all proposed mining at the North Rochelle, Black Thunder, and Jacobs Ranch Mines for incorporation of the Thundercloud LBA Tract and all proposed mining at the North Antelope/Rochelle Mines for incorporation of the Powder River LBA Tract.

Figure 4-2 was prepared using cumulative air quality modeling analysis prepared by the Black Thunder Mine in 1996 and the North Antelope and Rochelle Mines in 1993 and submitted to the Air Quality Division of WDEQ as part of two separate mine permit renewal packages (TBCC 1996; PRCC 1994). The figure illustrates modeled PM_{10} conditions in the year 2001, which is the predicted worst-case scenario for the Black Thunder, Jacobs Ranch, and North Rochelle mine complex, along with the predicted PM_{10}

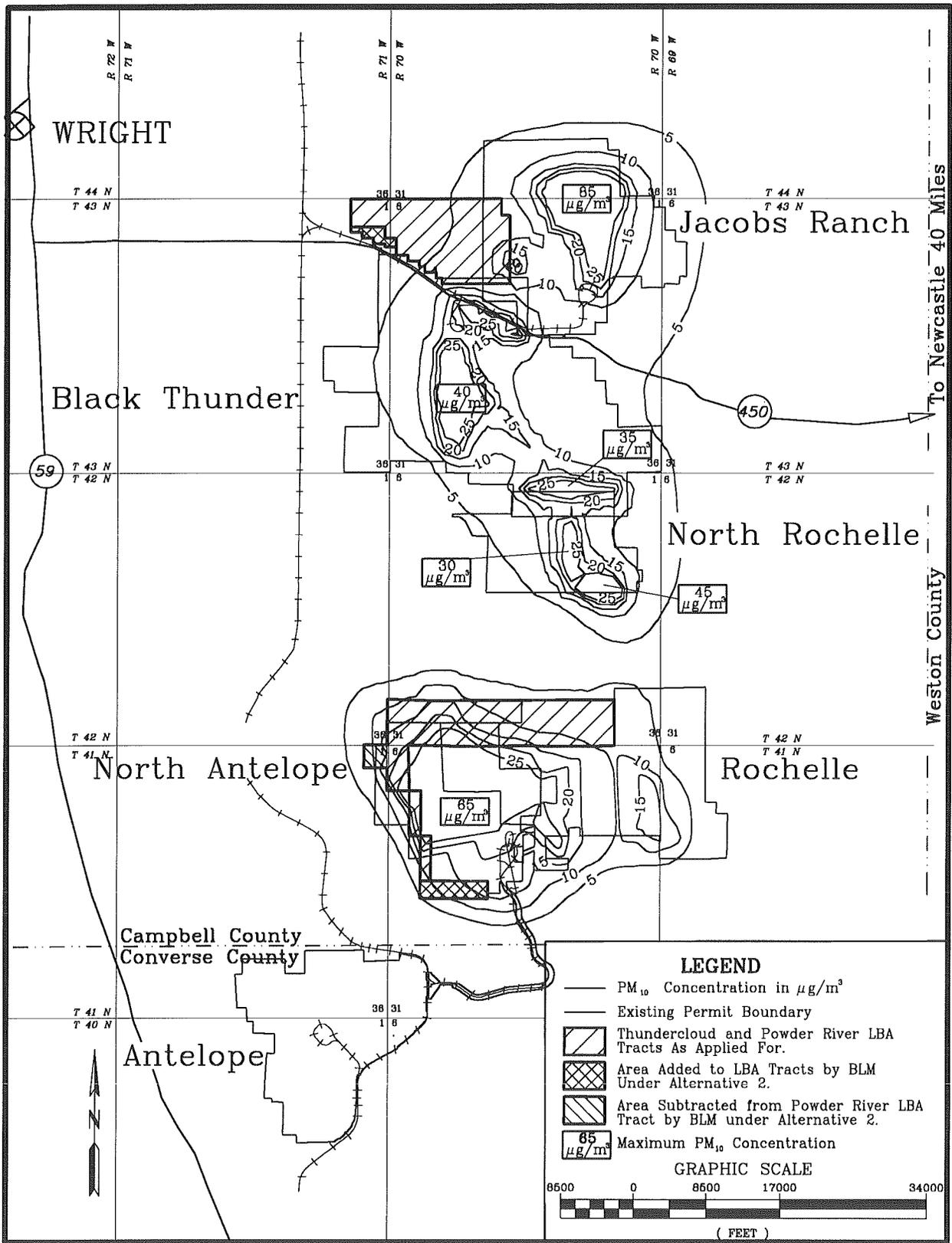


Figure 4-2. Modeled Average Annual PM₁₀ Concentrations in 2001 Resulting from Removal of 140 Million Tons of Coal at Jacobs Ranch, Black Thunder, North Rochelle, North Antelope and Rochelle Mines.

4.0 Environmental Consequences

concentrations in 2001 at North Antelope and Rochelle Mines. The figure depicts the relatively minimal off-site particulate impact of mining on ambient air quality and the rapid decay of PM_{10} concentration with increased distance from the mining areas. This combination of modeling efforts demonstrates that, given the total extraction of 162 million tons per year for the five mines in the modeled scenario, the $35 \mu\text{g}/\text{m}^3$ annual average PM_{10} standard would not be exceeded outside of any of the mines' permit boundaries. Concentrations above $35 \mu\text{g}/\text{m}^3$ are predicted in the areas of active pit, but the State standard requires only that particulate concentrations above $35 \mu\text{g}/\text{m}^3$ cannot be exceeded at the mine's permit boundary.

In addition to the modeled scenario for the five mines discussed above, there are two additional projects proposed for the area of analysis that were not considered in particulate modeling depicted on Figure 4-2. The air quality impacts of the two projects, the ENCOAL and Two Elk projects, are discussed below.

Air quality modeling performed for the ENCOAL plant and submitted to WDEQ (ENCOAL 1996) indicates that the particulate emissions will be minimal, with predicted average annual PM_{10} concentrations not exceeding $3.9 \mu\text{g}/\text{m}^3$. Off-site air quality impacts are not anticipated.

Air quality modeling conducted for the proposed Two Elk power generation facility and submitted to WDEQ (NAPG 1996) indicates that particulate emissions from the plant would be minimal, with predicted off-site emissions of $5 \mu\text{g}/\text{m}^3$ extending no more than 1,140 meters from the facility.

Based on 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 ($< 1 \mu\text{g}/\text{m}^3$ PM_{10} annual average) within 6 miles of active mining.

In the long term, impacts from PM_{10} emissions from mining the two LBA tracts would be negligible. If the two LBA tracts are mined, air quality will be decreased in the immediate area of active mining but will still continue to meet federal and state standards.

4.5.5 Water Resources

Surface Water

Changes in drainage patterns and surface disturbance are decreasing and will continue to decrease flows in most of the ephemeral and intermittent drainages exiting the mine sites. Development of coal bed methane resources in the area west of the mines could potentially increase surface flow in some drainages. Currently, there is little methane production occurring in the general analysis area. (Coal bed methane development was not considered in the CHIA (Martin et al. 1988)). The EIS that was prepared to analyze the impacts of coal bed methane development south of Gillette estimates that an average surface discharge of 20 gpm from each of the 423 wells would result in an increase in flow of 0.5% to 2.4% of the 2-year, 24-hour flood flows (per square mile) if all of the wells discharge into the same drainage basin. The amount of coal bed

methane produced water that ultimately reaches the major channels is reduced by infiltration into the ground and by surface landowners, who sometimes divert the produced water into reservoirs for livestock use because it is of relatively good quality.

The USGS has predicted that major streams in the PRB will exhibit increased runoff ranging from 0.4% in the Cheyenne River to 4.3% in Coal Creek due to cumulative disturbance as a result of existing surface coal mining (Martin et al. 1988). This is based on the assumption that unit runoff rates will be increased after reclamation due to soil compaction, and the percentage changes in runoff are based on permitted mine acreages in 1981. The additional leases since that time have increased the permitted acreage by about 40% and would, under the same assumptions, increase the USGS's estimates of runoff increase by the same incremental amount. This minor increase in runoff is small compared to seasonal and annual variability of runoff in the PRB.

Drainage from all six southern mines combines where Black Thunder Creek enters the Cheyenne River. The drainage area of the Cheyenne River at this point is approximately 2,430 mi². The entire area of disturbance from these six mines as currently permitted would impact approximately 2% of the drainage basin of the Cheyenne River, and this disturbance would occur over about 50 years. Planned LBA's and the New Keeline Mine would raise this disturbance acreage to roughly 3% of the Cheyenne River drainage basin at Black Thunder Creek.

Sediment concentrations should not increase significantly in area streams even with the addition of mining the pending and planned LBA tracts because, as discussed in Section 4.1.5, state and federal regulations require

that all surface runoff from mined lands pass through sedimentation ponds. The potential for cumulative adverse impacts to the Cheyenne River drainage is also minimal because it is typically dry for a substantial portion of the year.

Groundwater

The southern group of mines uses about 1,736 ac-ft of water per year for drinking, sanitation, washing equipment, and dust control. This water comes from aquifers below the coal, from seepage into the mine pits and from sediment- and flood-control impoundments. The southern mines pump an estimated 1,400 ac-ft per year from the pits and dewatering wells.

Extended consumption from water supply wells in aquifers below the coal will lower water levels in those aquifers. However, drawdowns in these deeper aquifers will not occur over wide areas because few wells are completed in these aquifers, the wells are generally more than a mile apart, and the water-bearing sandstones in these aquifers are generally discontinuous and have limited areal extent.

Coal bed methane is not currently being produced in the vicinity of the southern six mines, but based on current trends it is likely that development will continue southward in the direction of these mines. If coal bed methane is successfully developed adjacent to the six southern mines, the resulting groundwater drawdown in the Wyodak coal would overlap additively with drawdown caused by coal mining. Water levels in aquifers above the coal would not generally be impacted by coal bed methane development.

The water levels will gradually recover, as reclamation proceeds and coal bed methane

reserves are depleted. Coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining. A group of coal bed methane operators and local landowners have developed a water well mitigation agreement that can be used on a case-by-case basis as development proceeds. As specified in the decision record for the Gillette South Coal Bed Methane Project EIS, BLM is requiring coal bed methane operators to offer landowners this water well mitigation agreement as part of the federal well approval process.

In 1987, the USGS, in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern PRB to provide hydrologic information necessary to perform required assessments. The resulting description of the cumulative effects of all current and anticipated mining (as of 1987) on the hydrologic system of the eastern PRB is presented in the CHIA (Martin et al. 1988). This report details the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this EIS.

A cooperative agreement "to provide a framework for hydrologic data exchange, access to data, data sharing, and scientific applications for Wyoming surface and ground water as it relates to coal production statewide" was signed in 1993 by WDEQ, BLM, OSM, the University of Wyoming, the Wyoming State Engineer's Office, and the Wyoming State Geological Survey. Under this agreement, a pilot study analyzing existing and potential surface and groundwater impacts due to coal mining and coal bed methane development in the Little Thunder Creek Drainage was completed in 1997. The Little Thunder Creek Drainage is located in the south-central portion of the PRB and includes the Jacobs Ranch, Black

Thunder, and North Rochelle Mines. The pilot study was conducted at the Wyoming Initiative Laboratory of the University of Wyoming, with funding and direction from the cooperating agencies. Appendix G includes plates 14, 15, 16, and 17 of the pilot study, which show the modeled drawdown in the Wasatch Formation and Wyodak coal as a result of coal mining and coal bed methane development in the years 2005 and 2021. The pilot study investigated two predictive scenarios: surface mining alone from 1995 through 2021; and surface mining and coal bed methane production from 1995 through 2005 followed by surface mining alone from 2006 through 2021. The coal mining sequence was simulated from 1977 to the present and predictively modeled based on currently anticipated mining through 2021. Coal bed methane production was simulated in the area using the development scenario proposed in the 1995 BLM *Environmental Assessment for Lighthouse Coal Bed Methane Project*.

If the LBA tracts are leased, they must be permitted by WDEQ/LQD prior to mining. As part of this process, the applicants must assess the probable hydrologic consequences of mining the LBA tracts and the WDEQ/LQD must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside the permit areas.

The cumulative hydrologic impacts associated with mining the LBA tracts will be re-evaluated by the WDEQ/LQD based on site-specific, current data before the tracts can be mined. Each time a mine permit application or a revision is made, the WDEQ/LQD assesses cumulative hydrologic impacts based on site-specific information, which is targeted to determine the cumulative impacts of the applicant's mine or changes in

the applicant's mining plan in combination with other mines or activities in the area.

Assessment of cumulative groundwater impacts in this EIS is based on impact predictions made by PRCC for mining the Powder River LBA Tract and extrapolating drawdown predictions made by KMCC in 1994 for the mining of the Jacobs Ranch Mine into the Thundercloud LBA Tract. Figure 4-3 depicts the extent of the 5-ft drawdown contour within the coal aquifer from the various mining scenarios. The extent of the 5-ft drawdown contour is used by WDEQ to assess the extent of impact to the groundwater system caused by the different mining operations. In Figure 4-3, these predictions are compared to the predictions in the CHIA and monitoring information gathered since publication of the CHIA. In the area of the Jacobs Ranch and Black Thunder Mines, drawdowns in the Wasatch Formation overburden have not been modeled because of the limited extent of saturated sand aquifers. Therefore, Figure 4-3 shows only the predicted drawdowns in the coal aquifer due to coal mining. The plates included in Appendix G also consider potential coal bed methane development.

Monitoring programs are required by WDEQ/LQD and are administered by the mining companies. Each mine is required to monitor groundwater levels in the coal and in the shallower aquifers in the area surrounding their operations. There are also requirements for drilling monitoring wells in the backfill areas of the mines to record water level recovery.

GAGMO, a voluntary group formed in 1980, assembles and reports annual hydrologic monitoring data collected by the coal mining companies operating in the eastern PRB of Wyoming. Members of GAGMO include most of the companies with operating or

proposed mines in this area, WDEQ, Wyoming State Engineer's Office, BLM, USGS, and OSM.

Each year, GAGMO contracts with an independent firm to publish the results of the monitoring for that year. In 1991, GAGMO published a 10-year report which summarized the water monitoring data collected from 1980 to 1990 in the Wyoming PRB (Hydro Engineering 1991b). In 1996, a 15-year summary report was published (Hydro Engineering 1996a). The major groundwater issues related to surface coal mining that have been identified by scoping are:

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with spoil material;
- 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 effects of the use of water from the subcoal Fort Union Formation by the mines;
- changes in water quality as a result of mining; and
- potential overlapping drawdown in the coal due to proximity of coal mining and coal bed methane development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

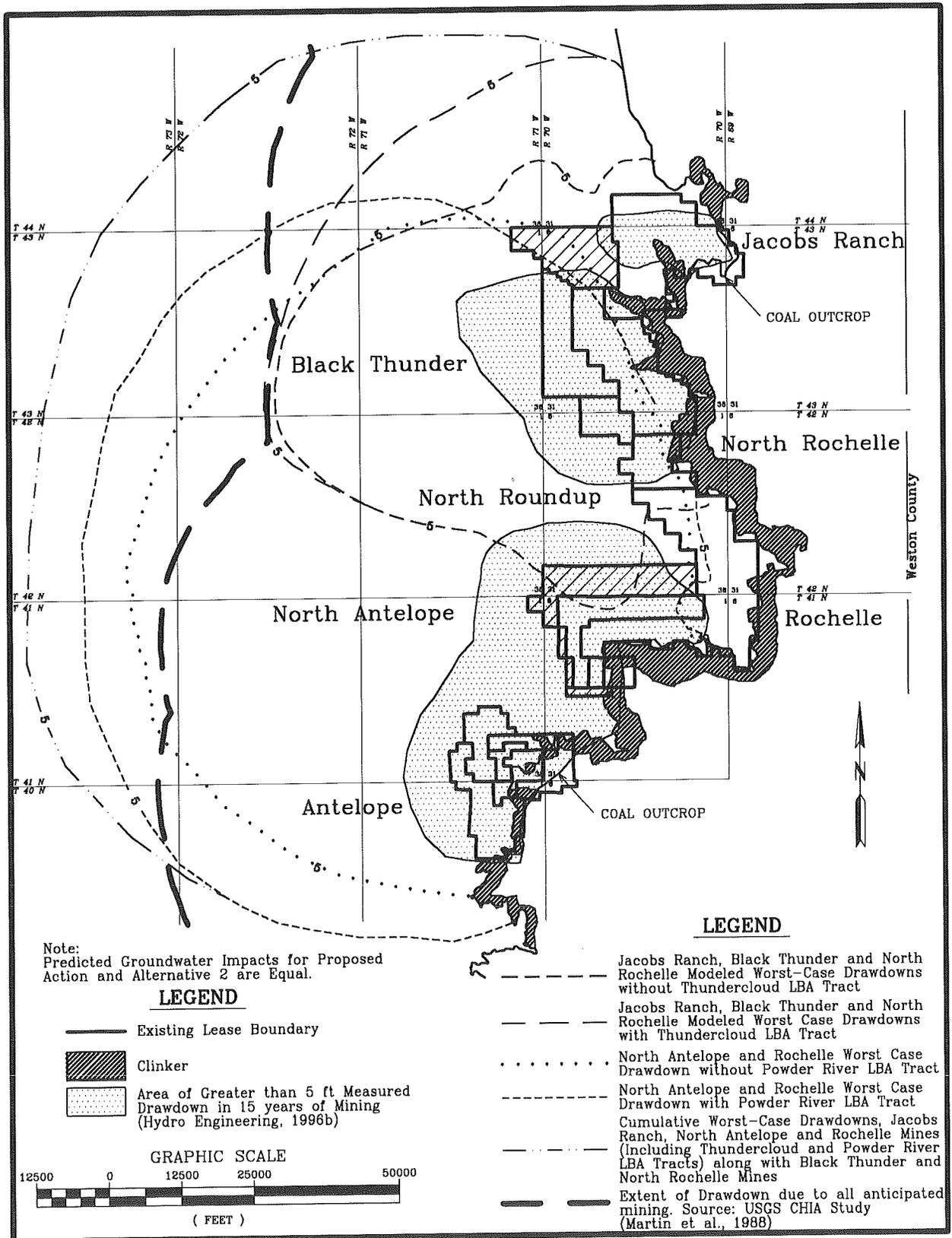


Figure 4-3. Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 15-Year Drawdowns and USGS Predicted Cumulative Drawdowns.

The effects of replacing the coal aquifer and overburden with a spoils aquifer is the first major groundwater concern. The following discussion of recharge, movement, and discharge of water in the spoil aquifer is excerpted from the CHIA (Martin et al. 1988:24):

Postmining recharge, movement and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining 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.

GAGMO data from 1990 to 1996 verify that recharge is continuing in the backfill (Hydro-Engineering 1991a, 1992, 1993, 1994, 1995, 1996b). The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill and compare them with the 1980 water levels, as estimated from the 1980 coal water-level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 89% of the backfill wells reported for that year. In the 1996 GAGMO 15-year report, 85% of the 58 backfill wells measured contained water. The discrepancy is due to the fact that more wells were measured in the 15-year report, some of which were recently drilled and did not contain water.

The cumulative size of the backfill area in the PRB and the duration of mining activity would be increased by mining of the recently issued leases and the currently proposed LBA tracts. However, since reclamation is occurring in mined-out areas and the monitoring data demonstrate that recharge of the backfill is occurring, it is not anticipated that additional significant impacts would occur as a result of any of the leasing actions.

The North Rochelle Mine is projected to become fully operational in 1997. Groundwater impacts associated with mining of the North Rochelle LBA Tract have not been considered in the worst-case predictions made by the mines surrounding North Rochelle. Mining of the North Rochelle LBA Tract should not increase the westward extent of current and anticipated drawdowns in the coal aquifer because the North Rochelle LBA Tract does not extend the areas of coal removal farther west than the existing Black Thunder lease and the rate of production is not anticipated to increase beyond that already permitted (BLM 1996h).

Clinker, also called scoria, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, occurs all along the coal outcrop area (Figure 4-3) and is believed to be the major recharge source for the spoil aquifer, just as it is for the coal. However, not all clinker is saturated. Some clinker is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the spoil aquifer is not being disturbed by current mining. Clinker does not occur in significant amounts on the LBA tracts being considered in this EIS.

The second major groundwater issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. Most of the monitoring wells included in the GAGMO 15-year report (542 wells out of 600 total) are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. The changes in water levels in the coal seams after 15 years of monitoring are shown on Figure 4-3, which was adapted from the 1996 GAGMO 15-year report (Hydro Engineering 1996a). This map shows the area where actual drawdown in the coal seam has been greater than 5 ft in 15 years, in comparison with the predicted worst-case 5-ft drawdown derived from groundwater modeling done by the mines. WDEQ/LQD policy is to have the mining companies determine the extent of the 5-ft drawdown contour as a method of determining off-site impacts from the various mining operations.

Figure 4-3 indicates that the drawdowns observed in 15 years of mining are still well within the total cumulative drawdown predicted in the CHIA. Adding the predictions for the Thundercloud and Powder River LBA Tracts to existing drawdown predictions prepared for the Black Thunder and North Rochelle Mines extends the predicted cumulative extent of the 5-ft drawdown some 11 miles past the cumulative drawdown prediction in the 1988 CHIA. To date, the CHIA predictions have not been exceeded, but with mining projected to continue at least another 20 years even without the addition of the two LBA tracts, the predictions in the 1988 CHIA are now projected to be exceeded.

The 1988 CHIA predicted the approximate area of 5 ft or more water level decline in the Wyodak coal aquifer which would result from "all anticipated coal mining". "All

anticipated coal mining" as referred to in the 1988 CHIA included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines, including Jacobs Ranch, North Antelope and Rochelle, were considered in the CHIA analysis (Martin et al. 1988). The study predicts that water supply wells completed in the coal may be affected as far away as 8 miles from mine pits, although the effects at that distance were predicted to be minimal.

Although the drawdowns predicted in this EIS exceed those predicted in the 1988 CHIA, as drawdowns propagate to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Based on premine water levels, there is approximately 300 ft of available drawdown at the western edge of the Thundercloud LBA Tract. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of methane wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so adverse impacts to wells outside the immediate mine area are unlikely.

Wells in the Wasatch Formation were predicted to be impacted by drawdown only if they were within 2,000 ft of a mine pit (Martin et al. 1988). Drawdowns occur farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers

(Wasatch Formation, alluvium, and clinker) 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 may be confined or unconfined.

Based on the above assumptions, the CHIA estimated that about 3,000 wells in the area would be subject to impact by current and anticipated mining in Wyoming's PRB. Of these, about 1,200 wells are outside the actual mine areas (i.e., will not be removed by mining). About 1,000 of these supply water for domestic or livestock uses, and about 200 supply water for other uses. The remaining 1,800 wells are used by coal mining companies: about 1,700 wells are monitor wells only, and the other 100 are used for water supply and/or dewatering at mine sites.

Wyoming State Engineer's Office records indicate a total of 585 permitted water wells located within three miles of the two LBA tracts. The majority (420) are owned by coal mining companies and are used for groundwater monitoring and water supply. Of the 165 non mine-related wells, 93 are permitted for stock watering, 7 are permitted for domestic use, 3 for filling reservoirs, 2 for industrial use, 1 for irrigation use and 9 for miscellaneous use. The 50 remaining wells are used for monitoring purposes.

Some of these wells will likely be impacted (either directly by removal of the well or indirectly by water level drawdown) by approved mining operations occurring at Jacobs Ranch, North Antelope, Rochelle and the adjacent mines. In compliance with SMCRA and Wyoming regulations, KMCC and PRCC would be 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 coal.

Appendix E contains a list of wells which are predicted in the current North Antelope/Rochelle mine permit documents to be affected by drawdowns from currently approved mining operations. The Jacobs Ranch mine permit states that no stock or domestic wells will be impacted by currently approved mining operations. The operators which acquire these LBA tracts will be required to update the list of potentially impacted wells during the permit process necessary to obtain approval to mine the tracts.

Since the actual 1995 drawdown lies within the cumulative drawdown predicted by the CHIA study, the cumulative impacts to water wells have not reached the maximum levels predicted in that report. Of the 1,200 water supply wells within the maximum impact area defined in the CHIA study, about 580 are completed in Wasatch aquifers, about 100 in the Wyodak Coal aquifer, and about 280 in strata below the coal. There are no completion data available for the remainder of these wells (about 240).

The additional groundwater impacts that would be expected as a result of extending mining into the LBA's issued or proposed to date would be to extend the drawdown into areas surrounding the proposed new leases. The predicted cumulative effects of mining both LBA tracts are depicted on Figure 4-3. Currently, the drawdown in the coal aquifer in the vicinity of the Jacobs Ranch and Black Thunder mines is expressed in two separate cones of depression; drawdown cones between the North Antelope/Rochelle and Antelope mines have coalesced. These cumulative drawdowns will be increased by

mining the Powder River LBA Tract, which is located between Antelope and North Antelope.

Dewatering activities associated with reasonably foreseeable coal bed methane development has the potential to extend the drawdown in the coal aquifer over a larger part of the southern PRB. As distance from the mines increases, drawdowns due to coal bed methane development would substantially exceed drawdowns that would occur due to mining alone. The Abandoned Mine Land Research Program has funded a grant to model relative drawdowns from coal mining and coal bed methane development in the area of the Cordero, Belle Ayr, and Caballo Mines and adjacent coal bed methane project areas (Figure 4-1). That work is currently in progress.

Withdrawal of water for the ENCOAL facility would lower water levels in the scoria aquifer to the east of the North Rochelle Mine if the rate of withdrawal exceeds recharge (currently unknown). As discussed above, the scoria provides the primary source of recharge to the Wyodak coal aquifer. As mining at the North Rochelle Mine continues, the coal will be removed and replaced with spoil, which would be expected to have the same conductivity as the Wyodak coal aquifer according to Martin, et al. (1988 p. 24). The primary impact due to lowering water levels in the scoria would be a potential delay in the recovery of water levels in the North Rochelle Mine backfill, as the rate at which the backfill would receive recharge from the scoria would be related to the scoria water levels. Based on the size of the scoria aquifer supplying ENCOAL and the amount of water to be withdrawn from it, complete recovery of the scoria water levels could take up to 100 years, slowing recovery of North Rochelle Mine spoil water levels for an equal duration. Since predictions for recovery of

water levels in the spoils range from tens to thousands of years, the additional delay in recovery caused by the ENCOAL water supply wells is within the range of predictions.

In addition to the ENCOAL plant, the proposed Two Elk project, if constructed, will also add to cumulative impacts. Currently, water demands for the Two Elk project have not been finalized. The likely source of supply for the Two Elk project will be the Lance-Fox Hills Aquifer.

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. According to the Wyoming State Engineer's records (1991), 14 mines hold permits for 42 wells between 400 ft and 10,000 ft deep. The zone of completion of these wells was not specified, and not all of the wells were producing (for example, three of the permits were held by an inactive mine, and one of the wells permitted by the Black Thunder Mine has not been used since 1984).

Water level declines in the Tullock Aquifer have been documented in the Gillette area. According to Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the city of Gillette. Most of the water-level declines in the subcoal Fort Union wells occur within 1 mile of the pumped wells (Crist 1991; Martin et al. 1988). The mine facilities in the PRB are separated by a distance of 1 mile or more, so little interference between mine supply wells would be expected.

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM commissioned a

cumulative impact study of the subcoal Fort Union Formation to study the effects of mine facility wells on this aquifer unit (OSM 1984). Conclusions from all these studies are similar and may be summarized as follows:

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.
- In the Gillette area, water levels in this aquifer are probably declining because the city of Gillette and several subdivisions are utilizing water from the formation (Crist 1991). (Note: Gillette is using this water as a back-up source at this time.)
- Because large saturated thicknesses are available in this aquifer unit, generally 500 ft or more, a drawdown of 100 to 200 ft in the vicinity of a pumped well would not dewater the aquifer.

Prior to amending the LBA tracts into their existing WDEQ mine permits, the applicants (KMCC and PRCC) will either be required to conduct more detailed groundwater modeling to predict the extent of drawdown in the coal and overburden aquifers caused by mining the LBA tracts or use the drawdown predictions in the pending CHIA. Both applicants have installed monitoring wells which would be used to measure drawdowns predicted by modeling. This modeling would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

The mines adjacent to the proposed maintenance LBA's all have permits from the

State Engineer for deeper wells. Extending the lives of these mines with the LBA's would result in additional water being withdrawn from the Tullock Aquifer. The additional water withdrawals would not be expected to extend the area of water level drawdown over a significantly larger area due to the discontinuous nature of the sands in the Tullock Aquifer and the fact that drawdown and yield reach equilibrium in a well due to recharge effects.

According to the State Engineer's Office, the only permitted wells drilled below 1,000 ft in a 100 mi² area surrounding Wright are four wells permitted by the City of Wright. As discussed above, most of the water-level declines in the subcoal Fort Union wells occur within 1 mile of pumped wells. The Thundercloud and Powder River LBA's, about 12 miles and 21 miles southeast of Wright, respectively, would not contribute significantly to any cumulative impact on the water supply for that town under the action alternatives because no new wells would be required to maintain existing production.

The fourth 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 spoil aquifer following mining?

In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be larger in water from spoil 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 premining environment. On the basis of studies done in North Dakota, it was estimated that at least one pore volume of water must leach the spoil before the dissolved solids concentration in the water would be similar to the premining dissolved solids concentration (Houghton et al. 1987). One pore volume of water is the volume of water which would be required to saturate the spoils following reclamation. The time required for one pore volume of water to pass through the spoil aquifer is greater than the time required for the postmining groundwater system to re-establish equilibrium. According to the CHIA, estimates of the time required to re-establish equilibrium range from tens to hundreds of years (Martin et al. 1988).

Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in spoil aquifers at 10 mines indicated that the quality of water in the spoil will, in general, meet state standards for livestock use when recharge occurs (Martin et al. 1988). The major current use of water from the aquifers being replaced by the spoils (the Wasatch and Wyodak-Anderson Coal aquifers) is for livestock because these aquifers are typically high in dissolved solids in their premining state (Martin et al. 1988).

According to monitoring data published by GAGMO (Hydro-Engineering 1991a, 1991b, 1992, 1993, 1994, 1995, 1996b), TDS values in backfill wells have ranged from 400 to 25,000 mg/L. Of the 52 backfill wells measured and reported in the 1996 annual GAGMO report (Hydro Engineering 1996a), TDS in 80.5% were less than 5,000 mg/L, TDS in 17% were between 5,000 and 10,000 mg/L, and TDS in 2.5% were above 10,000 mg/L. These data support the conclusion that water from the spoils will generally be acceptable for its current use, which is

livestock watering, before and after equilibrium is established. The incremental effect on groundwater quality due to leasing and mining of the LBA tracts would be to increase the total volume of spoil and, thus, the time for equilibrium to re-establish.

4.5.6 Alluvial Valley Floors

No cumulative impacts to alluvial valley floors are expected to occur as a result of leasing and subsequent mining of the Powder River and Thundercloud LBA Tracts.

4.5.7 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 not affected. Therefore, the impacts to wetlands as a result of surface coal mining are 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. The Jacobs Ranch Mine has been authorized to impact 80 acres of wetlands, the Rochelle Mine 21 acres of wetlands, and the North Antelope Mine 5 acres of wetlands. These numbers would increase if the LBA tracts are leased (see Section 3.8).

Wetlands must be replaced during reclamation, so the impacts to wetlands are not expected to be permanent; however, there is a period of time between disturbance and reclamation when wetland functions are lost. In addition, reclaimed wetlands may not function in the same way as the affected wetlands did before mining.

4.5.8 Vegetation

Most of the land that is being or will be disturbed is grassland, sagebrush shrubland or breaks grassland and is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the PRB, comprising 92% of the land use in Campbell and Converse Counties. A small amount of previously cultivated lands would be disrupted by mining. At the completion of mining, it is anticipated that all disturbed land will 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, will not be restored to premining conditions but may be replaced to a higher level due to use of better quality soils.

Based on annual reports prepared by mining companies and submitted to WDEQ, in any given year approximately 10,000 acres of land disturbed by mining activities at the six existing southern surface coal mines would not be reclaimed to the point of planting with permanent seed mixtures. Over the life of the six southern mines, a total of about 55,000 acres would be disturbed. This disturbed area includes all leases currently proposed, including federal, state and private coal. 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.

Several impacts to vegetation will occur as a result of operations at these six mines. Most of the surface disturbance would occur in two vegetation types: mixed grass prairie (25%) and Wyoming big sagebrush (40%). The big sagebrush vegetation type comprises 38% of the Thundercloud LBA Tract disturbance area and 33% of the Powder

River LBA Tract disturbance area, similar to the percentage for the six-mine southern cluster. Upland grassland comprises 29% of the disturbance area of both tracts. All six mines plan to restore these two types as required by law. It is estimated that it would take from 20 to 100 years for big sagebrush density to reach premining 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. Mule deer should not be affected since they are not as abundant in this area.

Although some of the less extensive native vegetation types (e.g., graminoid/forb ephemeral drainages) would be restored during reclamation, the cultivated and agricultural lands would not. Following reclamation and release of the reclamation bond, however, privately owned surface lands would be returned to agricultural management and the areas with re-established native vegetation could again be cultivated. The areas mapped as disturbed lands (see Section 3.9) would not be restored to premining conditions. Also, the breaks grassland on the Powder River LBA Tract will not be replaced due to their poor soils and rough topography. Consequently, community and species diversities would initially be lower on reclaimed lands. The shrub components would take the longest to be restored to premining conditions. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species re-invasion and shrub establishment on reclaimed lands should largely restore the species and community diversity on these lands to premining 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 with the exception of disturbed lands and lands which were cultivated at one time but have not been used for crop raising for many years. However, the shrub component may be substantially reduced in areal extent. Shrubs are relatively unproductive for livestock, but very important for wildlife. All of the vegetation types found in the cumulative analysis area, as on the LBA tracts, are fairly typical for this region of eastern Wyoming.

4.5.9 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 density, would cause a decrease in carrying capacity and diversity on the LBA tracts. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent.

Cumulative impacts to most wildlife will increase as additional habitat is disturbed but will moderate as more 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 and stipulations have helped to protect important raptor and grouse habitat. Erection of nesting structures and planting of trees on reclaimed land will gradually replace raptor nesting and perching sites. There is little crucial habitat for waterfowl or fish on the mine sites. Small- and medium-sized animals will rapidly 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.

Significant cumulative impacts to pronghorn resulting from existing concentrated mining and related disturbance were predicted in the regional EIS's (BLM 1974, 1979, 1981, and 1984b) as a result of habitat disturbance and creation of barriers to seasonal and daily movements. Significant cumulative indirect impacts were also predicted because of increased human population and access resulting in more poaching, increased vehicle/pronghorn collisions, and increased disturbance in general. Leasing of the LBA tracts would increase the area of habitat disturbance in the southern group of mines by 22%, and would enlarge the area where daily movement is restricted. There is little use of the LBA tracts by other big game species (mule deer, elk, and white-tailed deer).

The area of active mining in the southern group of mines contains significant numbers of raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country and areas where trees have become established. Raptor mitigation plans are 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 WGFDD. 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 proposed LBA tracts, would be insignificant because most of these birds are transient and most of the ponds are ephemeral. In addition, the more permanent impoundments and reservoirs that are impacted by mining would be restored. Sedimentation ponds and wetland mitigation sites would provide areas for waterfowl during mining.

Direct habitat disturbance from already-approved mining, as well as the LBA tracts, should not significantly 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 southern PRB 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. As a result, these species should

respond quickly and invade suitable reclaimed lands as reclamation proceeds.

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.

Additional discussions of cumulative impacts to wildlife from coal development and industrialization of the eastern PRB are discussed in BLM regional EIS's for the area (BLM 1974, 1979, 1981, 1984b), and these documents are incorporated by reference into this EIS. The impacts predicted in these documents have generally not been exceeded.

Cumulative impacts to USFS Region 2 Sensitive Species will be evaluated in a Biological Evaluation specific to this group when the lessee files an application for a surface mining permit, prior to mine development.

4.5.10 Threatened, Endangered, and Candidate Species

The USFWS has evaluated potential impacts to T&E species on the existing permit areas and has, in general, determined that no adverse impacts would occur to protected species.

OSM (1982) prepared a biological assessment of the eastern PRB in 1982 which concluded that mining operations might affect bald eagles. Following requirements of the Endangered Species Act, OSM requested a biological opinion from the USFWS, which was expanded to include a commentary on black-footed ferrets and peregrine falcons.

The opinion stated that cumulative impacts would not be adverse for bald eagles or peregrines but might be adverse for ferrets. As a result, OSM requires ferret surveys within 1 year of surface disturbance, either as a commitment in the mine plan or as a permit stipulation. USFWS requirements also mandate surveys for Ute ladies' tresses and mountain plovers in potential habitat prior to surface-disturbing activities. The swift fox is another candidate species that has potential habitat in the PRB. This species has not been recently recorded in the area and should not be impacted. Any potential impacts to T&E species would be mitigated as required. Thus, no significant cumulative impact to T&E species are projected, with or without leasing of the LBA tracts.

4.5.11 Land Use and Recreation

In addition to reducing livestock grazing and wildlife habitat, surface coal mining also disrupts oil and gas development and limits access to public lands, although the majority of the surface area being mined is privately owned.

Cumulative 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 and mule deer), and loss of recreational access to public lands (particularly for hunters).

There are no recreation facilities, wilderness areas, etc., in the immediate vicinity of the existing southern group of mines, and the majority of the land is seldom used by the public except for dispersed recreation (e.g., hunting), off-road vehicles, and sightseeing. Hunting and other public access is generally limited inside of the mine permit areas for safety reasons. However, approximately

80% of this land surface is private and access is controlled by the landowner.

The increased human presence associated with the cumulative energy development in the PRB has likely increased levels of legal and illegal hunting. Conversely, the mines in the 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, reclamation at the Jacobs Ranch Mine has been declared crucial elk winter habitat by WGF (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 eastern PRB. Mining the LBA tracts will support an increase in employment levels as coal production increases and will increase the years of production at the existing mines. The demand for outdoor recreational activities, including hunting and fishing, have increased proportionately. 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.

Campbell County's public recreation facilities are some of the most extensively

developed in the Rocky Mountain Region, and use by young, recreation-oriented residents is high. The relatively strong financial position of the county recreation program appears to assure future recreation opportunities for residents regardless of the development of the LBA tract or any other specific mine. Converse County's recreational facilities are not as advanced.

4.5.12 Cultural Resources

In most cases, treatment of eligible sites is confined to those that would be directly impacted, 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. An average density estimate of 8.5 sites per mi² (640 acres) can be made based on inventories at existing mines in the area, and approximately 25% of these sites are typically eligible for the NRHP. Approximately 550 cultural resource sites will be impacted by already-approved mines, with an estimated 140 of these sites being eligible for nomination to the NRHP. 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 be expected 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 provided opportunities for regional and local archeological research projects.

4.5.13 Native American Concerns

No cumulative impacts to Native American traditional values or religious sites are expected to occur as a result of leasing and subsequent mining of the Powder River and Thundercloud LBA Tracts.

4.5.14 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.

4.5.15 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 passing through the area or visiting it on mine-related business. Except for the silos and the draglines, the pits and facilities are not visible from more than a few miles away. No new facilities would be required to mine the LBA tracts as extensions of existing mines. Issuance of the LBA tracts would not change this impact.

After mining, the reclaimed slopes might appear somewhat smoother than premining slopes and there would be fewer gullies than at present. Even so, the landscape of the reclaimed mines would look very much like undisturbed landscape in the area.

4.5.16 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 LBA tracts would not increase the number of noise-producing facilities within the PRB, but it would lengthen the time this particular noise source would exist 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 and grazing lessees utilizing lands surrounding active mining

areas do hear mining-related noise; but this has not been reported to cause a significant 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 area 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 5 dBA) in noise levels along segments of the rail lines over which the coal is transported to markets. However, no significant adverse impacts have been reported as a result.

4.5.17 Transportation Facilities

No new cumulative impacts to transportation facilities are expected to occur as a result of leasing and subsequent mining of the Thundercloud and Powder River LBA Tracts. The transportation facilities for Jacobs Ranch and North Antelope/Rochelle Mines are already in place. Employment levels will not change as a direct effect of mining the LBA tracts, but employment will increase to support coal production increases and the length of employment will be extended. Traffic levels from both mines will be maintained for a longer period under the action alternatives.

4.5.18 Socioeconomics

Because of all the energy-related development that has been occurring in and around Campbell County during the past 30 years, socioeconomic impacts are a major concern. 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 assessed valuation on total minerals produced in 1990 accounted for 91% of the state's total assessed valuation. Because most minerals are taxed as percentage of their assessed valuation, this makes the mineral industry a significant revenue base for both local and state government in Wyoming (Department of Commerce, Economic and Community Development Division, Energy Section 1992).

Coal production in the PRB is projected to reach a record high of 319 million tons in the year 2002 before declining to about 295 million tons in 2005 (BLM 1996a). Coal prices are projected to remain relatively constant throughout this period (BLM 1996e). By 2005, annual coal production is projected to generate about \$2.6 billion of total economic activity, including \$351 million of personal income, and would support the equivalent of nearly 15,885 full-time positions (BLM 1996a).

In addition to the Thundercloud and Powder River LBA Tracts, a number of mineral and related developments are anticipated in Campbell County and the surrounding area. The North Rochelle Mine located southeast of Wright, WY is currently approaching an \$83.6 million mine expansion phase (Gillette News Record 1996b). The mine expansion was permitted in July 1995 by WDEQ/LQD. Construction of the mine facilities began in June 1997 and is scheduled to last about two years. A peak construction-phase work force of 246 persons is anticipated in the fourth quarter of 1997 (Planning Information Corp. 1997).

Construction of the \$744 million ENCOAL plant was planned to coincide with the North Rochelle Mine expansion with construction starting in late 1997 and lasting approximately two years. A peak construction-phase work force of 1,560 persons was anticipated in the third quarter of 1998. The plant was scheduled to operate for at least 30 years and would produce approximately 5,500 tons per day of solid fuel when the plant is in full operation. The North Rochelle mine expansion and ENCOAL plant had been scheduled to go into operation in 1999 with a combined estimated operational work force of 222 persons. On August 29, ENCOAL announced that the contract for construction had been terminated. The company stated that they "...remain optimistic about the... technology...and...intend to continue to work toward construction of a commercial plant to meet the appropriate market timing..." (Ziegler Coal Holding Company, August 29, 1997).

The Two Elk plant is currently in the developmental stage, and North American Power Group is working on permitting and marketing. Construction of the plant was expected to begin in the third quarter of 1997, however, construction has not yet begun. The cost for constructing the proposed plant is estimated at \$290 million. Construction is expected to last approximately two years with a peak construction-phase work force of approximately 752 persons anticipated in the fourth quarter of the construction period.

According to information provided by the Dakota, Minnesota & Eastern Railroad Corporation, construction of the DM&E railroad line is expected to start in 1999, take two years and cost \$1.5 billion. For Wyoming, the estimated direct construction-phase work force is 700 persons.

If the North Rochelle, ENCOAL and Two Elk projects had all started in 1997 as scheduled, increased employment in Campbell County would have peaked at 2,429 persons in the second quarter of 1998 during the construction phase, and construction would have been completed on all three projects in late 1999. There would potentially have been some construction-phase overlap with the anticipated start of construction of the DM&E rail line in 1999. Depending on when construction begins on the ENCOAL and Two Elk plants, there still could be overlapping construction employment with either or both the North Rochelle and the DM&E Railroad construction phases. At the end of the construction phases, it is estimated that a total of 452 workers would be employed by all four projects.

If all of these new projects are undertaken, it is estimated that the local populations of the communities in northeastern Wyoming would grow. If construction of North Rochelle, ENCOAL, and Two Elk had begun in 1997, as previously anticipated, it was estimated that non-local populations in northeastern Wyoming would have grown by 2,900 persons during the second half of 1998. The populations of Wright, Douglas, Newcastle, and Upton were projected to increase by approximately 1,751, while populations in other areas of Campbell, Converse, and Weston counties could have increased by 1,172. Under that scenario, the number of additional residents related to those three projects was expected to have been 455 after the construction phase. Currently, the North Rochelle construction project is underway and is projected to end in 1999; the ENCOAL and Two Elk construction schedules are uncertain; and DM&E is projecting that its construction would begin in 1999. If ENCOAL and/or Two Elk construction begins in 1998 or 1999, there

would be some overlap with both the North Rochelle construction and the DM&E construction. If construction on those two projects is delayed beyond 1999, there would be conflict with the DM&E construction phase.

According to the Planning Information Corporation (1997), if construction had proceeded as planned for the North Rochelle Mine, the ENCOAL plant and the Two Elk plant, the Gillette area could have experienced a demand for 545 dwelling units during the second quarter of 1998, with the demand dropping to 75 dwelling units at the end of the construction phase. The number of dwelling units in demand in Wright could have increased to 273 during the peak phase of construction and dropped to 37 after the construction phase. Other areas that could have experienced some demand in housing during the peak phase on construction included Douglas, Newcastle and Upton. This could have created some housing shortages, especially in the temporary housing market. Such shortages still could occur if all of the potentially planned projects are undertaken by 1999 or 2000, however, the projected housing shortage situation could be offset by the increase in vacancy rates in Gillette that was discussed in a recent article in the Gillette News Record (Gillette News Record, 1997). The reduction in Gillette population and increase in vacancy rates were not anticipated in the Planning Information Corporation study.

The effects of the three developmental projects could temporarily increase the total school enrollment during two years of coincidental construction. The total number of students added to the Gillette and Wright school systems is projected at 140 and 70 students, respectively. This growth was anticipated to occur in the fourth quarter of 1998.

During the construction phase of the developmental projects, assistance money could total \$7.5 million for Gillette, \$4.43 million for Campbell County and \$527,000 for Wright (Planing Information Corp. 1997). Assuming local sales and use tax permits are required, the developmental projects if approved would generate about \$12.5 million for Gillette, Wright and Campbell County. The State of Wyoming would receive approximately \$16.99 million from the developmental projects. Ad valorem tax is paid on production and property (State of Wyoming; Department of Commerce, Energy Section 1997). If all three developmental projects proceed as planned, ad valorem tax paid in 2001 is estimated to approach \$10 million (Gillette News Record 1996).

4.6 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

From 1997 on, the Jacobs Ranch Mine would be able to produce coal at the permitted production level for another 18.1 years under the Proposed Action and for 18.6 years under Alternative 2. The North Antelope/Rochelle Mines could produce coal at the permitted production level for about 19 years. As the coal 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 LBA tracts provide would be temporarily lost during mining and reclamation. During mining of the LBA

tracts, there would be a combined loss of native vegetation on 8,375 acres (Proposed Action) or 8,503 acres (Alternative 2) with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur over a period of years. The mine sites would be returned to equivalent or better forage production capacity for domestic livestock before their performance bonds are released. Long-term productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb pronghorn habitat, but the LBA tracts would be suitable for pronghorn following successful reclamation. Reduced topographic diversity in the breaks areas would make the area permanently less suitable for mule deer. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining 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 would be a deterioration of the groundwater quality in the lease area because of mining; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. During mining, depth to groundwater would increase as much as 5 miles away from the pits in the coal aquifer. The water levels in the coal aquifer should return to premining levels at some time (possibly more than 100 years) after mining has ceased.

Mining operations and associated activities would degrade the visual resources of the area on a short-term basis. Following removal of surface facilities and completion of reclamation, 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 the lease area. However, because reclamation would result in a wildlife habitat similar to that which presently exists, there should be no long-term adverse impacts on recreation.

The Proposed Action and Alternative 2 would extend the life of North Antelope and Rochelle Mines by 7.5 and 7.8 years, respectively. The Proposed Action would extend the life of Jacobs Ranch Mine by 11 years while Alternative 2 would extend the mine life by 11.5 years, thereby enhancing the long-term economy of the region.

4.7 Irreversible and Irretrievable Commitments of Resources

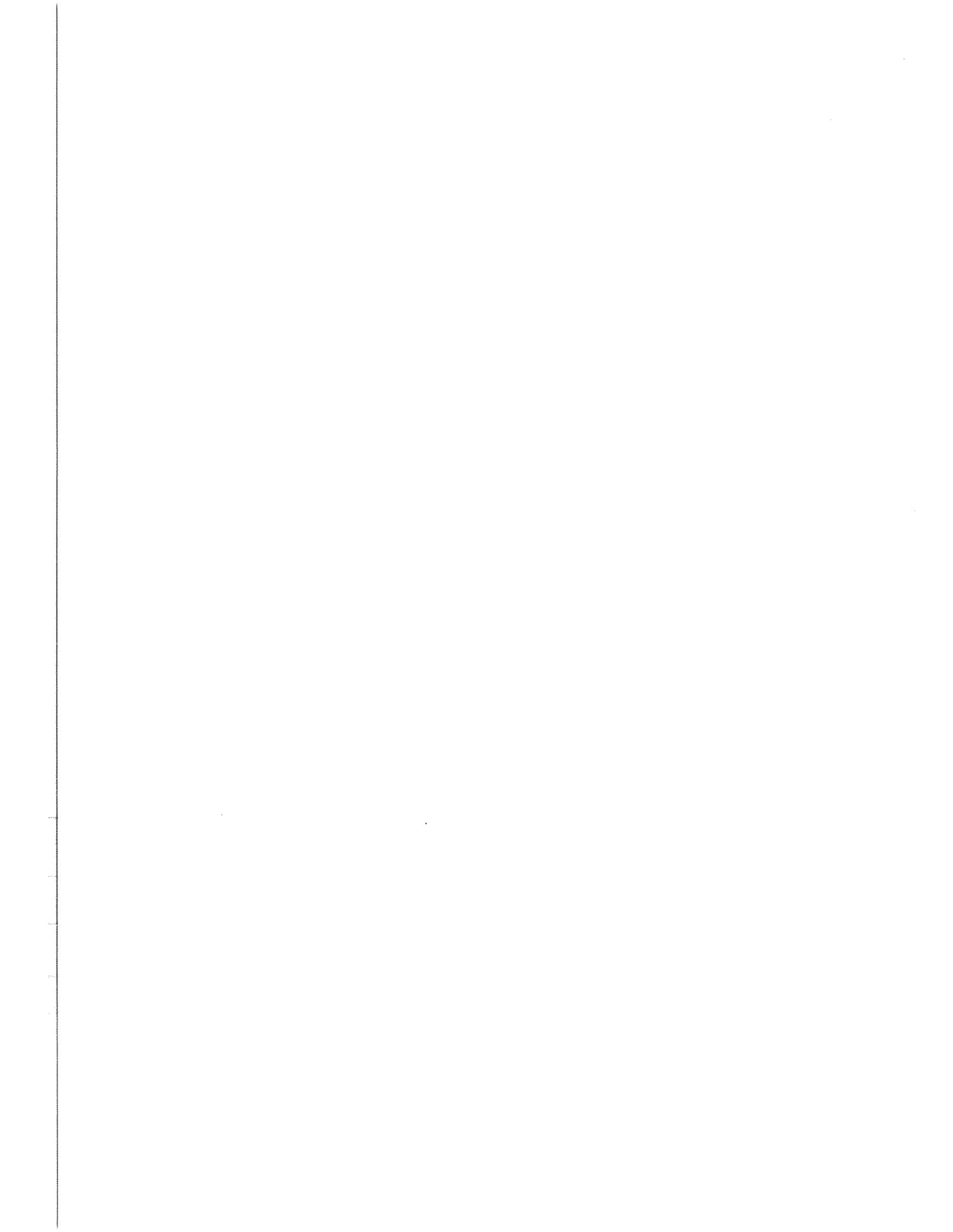
The major commitment of resources would be the mining and consumption of 873 million tons (Proposed Action) or 894 million tons (Alternative 2) of coal to be used for electrical power generation. Coal bed methane associated with this coal would also be irreversibly and irretrievably lost. It is estimated that 1-2% 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 8,375 acres (Proposed Action) or 8,503 acres (Alternative 2) 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 archeological 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 these proposed lease applications. These include the following.

Regional Coal Team Consultation. The Thundercloud and Powder River lease applications were reviewed and discussed at the April 23, 1996, PRRCT meeting in Cheyenne, Wyoming and the April 23, 1997 PRRCT meeting in Casper, Wyoming. The PRRCT determined that the lands in the applications met the qualifications as production maintenance tracts and approved the applications for processing by the lease-by-application method.

Governor's Consultation. The BLM Wyoming State Director notified the Governor of Wyoming on May 5, 1995, and August 23, 1995, that lease applications had been filed with the BLM for the Powder River and Thundercloud LBA tracts, respectively.

Public Notice. The BLM filed public notice on March 12, 1996 announcing that both these coal lease applications had been received and requesting public comment. The BLM published a Notice of Intent to Prepare an Environmental Impact Statement in the *Federal Register* on June 20, 1996, requesting public comments and announcing the time, date, and location of a public scoping meeting. BLM and EPA published Notices of Availability of the DEIS in the *Federal Register* on August 29, 1997 and August 22, 1997, respectively. The BLM notice included a notice of public hearing. The public hearing was held at 7:00 p.m. on October 8, 1997 at the Holiday Inn in Gillette, Wyoming. The public comment

period on the DEIS ended on October 28, 1997. Comments from the public, state and federal review agencies, and the BLM responses to the comments, are presented in Appendix H.

Attorney General Consultation. After a coal lease sale, but prior to issuance of a lease, the BLM will solicit the opinion of the U.S. Attorney General on whether the planned lease issuances create a situation inconsistent with federal anti-trust laws.

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 interdisciplinary team and the third-party consultant personnel who prepared 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).

5.0 Consultation and Coordination

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	
Wyoming Game and Fish Department	Pat Deibert	Sr. Environmental Analysts
	Lynn Jahnke	Wildlife & Fish Supervisor
	Steve Tessman	Environmental Biologist
Wyoming Department of Environmental Quality		
Air Quality Division	Richard Schrader	Sr. Analyst
	Tina Jenkins	Sr. Analyst
	Bob Schick	Sr. Analyst
	Judy Schamley	Sr. Analyst
Wyoming Department of Environmental Quality		
Land Quality Division	Roberta Hoy	Hydrogeologist
Wyoming State Geological Survey	Gary Glass	State Geologist
Wyoming Oil and Gas Commission	Molly Devore	Information Specialist
	Mark Watson	Petroleum Engineer
Wyoming Department of Revenue	Ed Schmidt	Mineral Tax Division Director
	Dean Tempti	Economist
U.S. Department of Labor, Mine Safety and Health Administration	Harvey Padgett	Mine Safety & Health Specialist
University of Wyoming	David Taylor	Associate Professor

Table 5-2. List of Preparers

Name	Education/Experience	EIS Responsibility
BLM/USFS/OSM INTERDISCIPLINARY TEAM		
Core Team		
Nancy Doelger, BLM	M.S., B.S. Geology, 19 years professional experience (Licensed Wyoming Geologist)	Project Coordinator
Mike Karbs, BLM	M.S. Regional Planning and Public Policy, B.S. Mineral Engineering, 21 years professional experience	Document Reviewer
Eugene Jonart, BLM	B.S. Forest/Range Management, 30 years professional experience	Document Reviewer
Mel Schlagel, BLM	M.S. Agricultural Economics, 29 years professional experience	Document reviewer
David Geer, USFS	B.S. Forest Resource Management, 21 years professional experience	Project Coordinator
Floyd McMullen, OSM	M.S. Environmental Science, B.S. Range/Forest Management, 23 years professional experience	Project Coordinator
Support Team		
Glen Nebecker, BLM	M.S., B.S. Botany, 17 years professional experience	Document Reviewer
Norman Braz, BLM	M.B.A., B.S. Geology, 17 years professional experience (Licensed Wyoming Geologist)	Geologist
Lou Ouano, BLM	B.S. Civil Engineering, 19 years professional experience	Mining Engineering
Mavis Love, BLM	17 years professional experience	Adjudicator
B.J. Earle, BLM	B.A. Archaeology, 21 years professional experience	Cultural Resources
Larry Gerard, BLM	B.S. Wildlife Management, 21 years professional experience	Wildlife Resources
Mike Brogan, BLM	B.S. Watershed Management/Hydrology/Forestry, 19 years professional experience	Hydrology
Joe Meyer, BLM	B.S. Watershed Management with Soils Minor, 15 years professional experience	Soils
Laura Steele, BLM	24 years professional experience	Ajudicator
Tom Enright, BLM	B.S. Forestry, 31 years professional experience	Document Reviewer
Vern Rulli, BLM	M.S. Geology, B.S. Geologic Engineering, 19 years professional experience	Mine Engineering
Joe Reddick, USFS	B.S. Forestry, 26 years professional experience	Lands and Minerals
Tim Byer, USFS	B.S. Wildlife Management, 14 years professional experience	Wildlife
Sherry Dahl-Cox, USFS	B.S. Agonomy and Soil Science, 9 years professional experience	Rangeland Management
Jeff Tupala, USFS	M.S. Landscape Architecture, B.S. Forestry, 9 years professional experience	Visual Resources
Bill Steenson, USFS	M.S. Forest Science, 31 years professional experience	Environmental Coordinator

5.0 Consultation and Coordination

Table 5-2. (cont'd)

Name	Education/Experience	EIS Responsibility
Ian Ritchie, USFS	M.A. Archeological Management, 12 years professional experience	Heritage Resources
Rob Schmitzer, USFS	B.S. Forest Biology, 20 years professional experience	Recreation/Engineering
Kirk Wolfe, USFS	B.S. Forest Resource Management, 18 years professional experience	Hydrology
Tommy John, USFS	B.S. Forestry, 20 years professional experience	Soils

WESTERN WATER CONSULTANTS, INC.

Doyl Fritz	M.S., B.S. Civil Engineering, 26 years professional experience	Report Preparation
Mike Evers	M.S., B.S. Geology, 13 years professional experience (Licensed Wyoming Geologist)	Project Management, Report Preparation
Lisa Jarvis	B.S. Geology, 15 years professional experience (Licensed Wyoming Geologist)	Report Preparation
Mike Wolf	B.S., Geology, 21 years professional experience (Licensed Wyoming Geologist)	Geology
Lori Rousseau	M.S. Civil Engineering, B.S. Biology, 3 years professional experience	Physical Resources
Shawn Higley	M.S., B.S. Civil Engineering, 4 years professional experience	Water Resources
Rodney Ventling	7 years professional experience	CADD
Dave Johnson	3 years professional experience	CADD
Laura Ingram	12 years professional experience	Document Production

INTERMOUNTAIN RESOURCES

Jim Orpet	M.S. Range Management, B.S. Wildlife Management, 19 years professional experience	Physical resources
Bill Glenn	B.S. Agronomy, 31 years professional experience	Soil Baseline
Russel Tait	B.S. Wildlife Management, 4 years professional experience	Wildlife Baseline

POWDER RIVER EAGLE STUDIES

Howard Postovit	M.S., B.S. Zoology, 19 years professional experience	Wildlife Baseline
Gwyn McKee	M.S., B.S. Wildlife Biology, 9 years professional experience	Wildlife Baseline
Mark Winland	B.S. Biology, 7 years professional experience	Wildlife Baseline

Table 5-3. Distribution List. Final EIS or Executive Summary

<u>Powder River Regional Coal Team</u>	Carol Molnia	<u>Congressional Offices</u>
<u>Voting Members</u>	U.S. Geological Survey Denver, CO	U.S. Congresswoman Barbara Cubin Casper, WY
Jim Geringer Governor of Wyoming Cheyenne, WY	Chairman William Walks Along Northern Cheyenne Tribal Council Lame Deer, MT	U.S. Senator Michael Enzi Casper, WY Gillette, WY
Marc Racicot Governor of Montana Helena, MT	Madame Chairman Clara Nomee Crow Tribal Council Crow Agency, MT	U.S. Senator Craig Thomas Casper, WY Sheridan, WY
Al Pierson BLM Wyoming State Director Cheyenne, WY	Tom Langston Department of Community Development Gillette, WY	<u>Federal Agencies</u>
Larry Hamilton BLM Montana State Director Billings, MT	John Young Big Horn County Planning Board Decker, MT	Bureau of Land Management Rawlins, WY Buffalo, WY Mills, WY Miles City, MT
Robert Bennett BLM Deputy State Director Minerals and Land Cheyenne, WY	Ted Fletcher Powder River County Ashland, MT	National Park Service Washington, D.C. (5 copies)
<u>Powder River Regional Coal Team</u>		Office of Surface Mining Reclamation & Enforcement Casper, WY Denver, CO Washington, D.C. (3 copies)
<u>Non-Voting Members</u>	Joan Stahl Rosebud County Commissioner Forsyth, MT	Advisory Council on Historic Preservation Golden, CO
Hord Tipton BLM Assistant Director Energy and Mineral Resources Washington, D.C.	Lyle Rising Office of the Regional Solicitor Rocky Mountain Region Denver, CO	U.S. Geological Survey Cheyenne, WY Reston, VA (3 copies)
Kemper McMaster U.S. Fish & Wildlife Service, Region 6 Helena, MT	Brenda Aird BLM Solids Group Washington, D.C.	U.S. Environmental Protection Agency Region VIII, Denver, CO OFA, Washington, D.C. (5 copies)
Billie Clark Office of Surface Mining Reclamation & Enforcement Western Field Operations Denver, CO	Mary Jennings U.S. Fish & Wildlife Service Cheyenne, WY	U.S. Department of the Interior OEPR, Washington, D.C. (5 copies) Public Affairs, Washington, D.C. Natural Resources Library, Washington, D.C. (3 copies)
John Byers U.S. Forest Service Medicine Bow National Forest Laramie, WY	Bureau of Indian Affairs Billings, MT	U.S. Department of Energy Washington, D.C. Casper, WY
Deborah Liggett NPS, Devils Tower National Monument Devils Tower, WY	Roger Baker Office of Surface Mining Denver, CO	Bureau of Reclamation Denver, CO (2 copies)
Mel Schlagel BLM Wyoming Coal Coordinator Cheyenne, WY	Dave Geer U.S. Forest Service Douglas, WY	U.S. Fish & Wildlife Service Washington, D.C. (3 copies)
Ed Hughes BLM Montana Coal Coordinator Billings, MT	Bill Radden-Lesage BLM Human Resource Group Washington, D.C.	

5.0 Consultation and Coordination

Table 5-3 (cont'd)

	Representative Eli D. Bebout Riverton, WY	Wyoming Economic Development & Stabilization Board Cheyenne, WY
U.S. Department of Agriculture Forest Service Denver, CO Washington, D.C.	Rep. George B. McMurtrey Rozet, WY	Wyoming Industrial Siting Division Cheyenne, WY
U.S. Army Corps of Engineers Cheyenne, WY Omaha, NE	Senator Gerald E. Geis Worland, WY	Wyoming Parks & Cultural Resources Commission Cheyenne, WY
Minerals Management Service Denver, CO Washington, D.C. (3 copies)	Senator Bill Barton Upton, WY	Wyoming Public Service Commission Cheyenne, WY
MMS Evaluation Standards Denver, CO	Representative Rick Badgett Sheridan, WY	Wyoming State Inspector of Mines Rock Springs, WY
Office of Surface Mining Technical Library Denver, CO	Representative Bruce Burns Sheridan, WY	Wyoming Water Development Office Cheyenne, WY
	Representative Bill Bensel Sheridan, WY	Wyoming Game and Fish Department Cheyenne, WY Gillette, WY Lander, WY Sheridan, WY
<u>State Government</u>	Senator Tom Kinnison Sheridan, WY	
Senator Dick Erb Gillette, WY	Representative Ross Diercks Lusk, WY	Wyoming State Geological Survey Laramie, WY
Representative Nick Deegan Gillette, WY	Representative Roger Huckfeldt Torrington, WY	Wyoming Department of Transportation Cheyenne, WY
Representative Douglas Osborn Buffalo, WY	Representative Patti MacMillan Laramie, WY	Wyoming Department of Employment Research and Planning Casper, WY
Representative Jim Anderson Glenrock, WY	Representative Jeff Wasserburger Gillette, WY	Wyoming Oil and Gas Conservation Commission Casper, WY
Representative John J. Hines Gillette, WY	<u>State Agencies</u>	
Senator Larry Gilbertz Gillette, WY	Wyoming State Clearinghouse Cheyenne, WY (15 copies)	Wyoming State Engineer's Office Cheyenne, WY
Representative Bruce Hinchey Casper, WY	Wyoming State Historic Preservation Office Cheyenne, WY	Wyoming Division of Econ. Analysis Cheyenne, WY
Representative Sylvia Gams Cowley, WY	Wyoming Department of Environmental Quality Cheyenne, WY Sheridan, WY	
Senator Boyd L. Eddins Smoot, WY	Wyoming Director of Federal Land Policy Cheyenne, WY	Campbell County Commissioners Gillette, WY
Senator Robert Grieve Savery, WY	Wyoming Department of Agriculture Cheyenne, WY	Campbell County Economic Development Committee Gillette, WY
Senator John Schiffer Kaycee, WY	Wyoming Department of Commerce Cheyenne, WY	Campbell County School Superintendent Gillette, WY
Representative Marlene Simons Beulah, WY	Wyoming Division of Tourism Cheyenne, WY	City of Gillette Gillette, WY
Representative Frank Moore Douglas, WY		

Table 5-3 (cont'd)

Converse County Commissioners Douglas, WY	Northern Cheyenne Cultural Committee Lame Deer, MT	Powder River Coal Company Gillette, WY
Converse County Commissioner Mr. Leon Chamberlain Douglas, WY	Northern Cheyenne Tribe, Inc. Lame Deer, MT	Kerr-McGee Coal Corporation Oklahoma City, OK Gillette, WY
Converse County Planning Office Douglas, WY	Philip Under Baggage Oglala Sioux Tribal Council Pine Ridge, SD	Wyodak Resources Development Corporation Gillette, WY
Converse County Joint Powers Board Douglas, WY	Cheyenne River Sioux Tribal Council Eagle Butte, SD	Caballo Rojo Coal Company Gillette, WY
Converse County School District #1 Douglas, WY	Crow Creek Sioux Tribal Council Fort Thompson, SD	Antelope Coal Company Gillette, WY
City of Douglas Douglas, WY	Flandreau Santee Sioux Executive Committee Flandreau, SD	Kennecott Energy Company Gillette, WY
Weston County Commissioners Newcastle, WY	Santee Sioux Tribal Council Niobrara, NE	Cordero Mining Company Gillette, WY
Weston County School Superintendent Newcastle, WY	Mr. Clifford Long Sioux Busby, MT	Dry Fork Coal Company Gillette, WY
Weston County Development Board Newcastle, WY	Mr. Steve Brady Lame Deer, MT	Bridgeview Coal Company Farmington, PA
<u>Indian Tribes & Tribal Governments</u>	<u>Industry and Business</u>	Consol, Inc. Pinckneyville, IL
Arapahoe Tribal Council Fort Washakie, WY	Wright Chamber of Commerce Wright, WY	Nerco Coal Co. Ione, CA
Northern Arapahoe Business Council Fort Washakie, WY	Newcastle Chamber of Commerce Newcastle, WY	Gillette Chamber of Commerce Gillette, WY
Francis Brown Riverton, WY	Amax Coal West Gillette, WY	Douglas Chamber of Commerce Douglas, WY
William C'Hair Arapahoe, WY	Triton Coal Company Gillette, WY Evansville, IN	Fort Union, Ltd. Gillette, WY
Shoshone Tribal Council Fort Washakie, WY	ENCOAL Gillette, WY	Elliot & Waterman Newcastle, WY
Shoshone Business Council Fort Washakie, WY	Glenrock Coal Co. Glenrock, WY	Zephyr Exploration Casper, WY
Haman Wise Fort Washakie, WY	Kiewit Mining Co. Sheridan, WY	Tri-County Electric Association Sundance, WY
John Tarnesse Fort Washakie, WY	Decker Coal Company Omaha, NE	CH2M Hill Englewood, CO
Crow Tribal Council Crow Agency, MT	ARCO Coal Co. Denver, CO	Evergreen Enterprises Casper, WY
Crow Tribal Administration Crow Agency, MT	Thunder Basin Coal Company Wright, WY	PacifiCorp/Interwest Mining Company Resource Department Salt Lake City, UT

5.0 Consultation and Coordination

Table 5-3 (cont'd)		
Union Pacific Resources Company Rock Springs, WY Fort Worth, TX	Riverside Technology, Inc. Fort Collins, CO	Andover Partners Wolf Exploration Co. Houston, Texas
Atlantic Richfield Company Denver, CO	CE&MT, Inc. Gillette, WY	ANR Production Co. Coastal Oil & Gas Corp. Houston, TX
Berenergy Corporation Denver, CO	Foster-Wheeler Environmental Lakewood, CO	Aztec Gas & Oil Truth or Consequences, NM
M&K Oil Company Gillette, WY	Greystone Englewood, CO	B S & B Oil Co. Casper, WY
Yates Drilling Company Artesia, NM	TRC Environmental Englewood, CO	Gloster Production Properties LTD New Orleans, LA
Bridle Bit Ranch Company Gillette, WY	Geral Jacob Environmental Const. Boulder, CO	Bellexco, Inc. Houston, TX
Dilts Ranch Co. Douglas, WY	Brian Kennedy Ind. Consultant Network Boulder, CO	Benson-Montin-Greer Drilling Corp. Farmington, NM
Western Water Consultants, Inc. Sheridan, WY	Hardin & Associates Castle Rock, CO	Maxim Drilling & Exploration Co. Denver, CO
Powder River Eagle Studies Inc. Gillette, WY	Intermountain Resources Laramie, WY	Maurice W. Brown Cheyenne, WY
Royal Gold, Inc. Denver, CO	Geral Jacobs Environmental Cons. Boulder, CO	Four-Ten Exploration Denver, CO
BXG, Inc. Boulder, CO	Brian Kennedy Ind. Consultant Network Boulder, CO	Western Gas Processors Denver, CO
TRC Mariah Associates Inc. Laramie, WY	L.E. Peabody & Associates Alexandria, VA	BWAB Inc. Denver, CO
P&M Coal Company Englewood, CO	Meineadair Consultants Arvada, CO	Calder Services Inc. Farmington, NM
C.H. Snyder Company Kittanning, PA	Western Syncoal Co. Billings, MT	T.A. Chorney Exploration Co. Littleton, CO
Mine Engineers, Inc. Cheyenne, WY	Mining Associates of Wyoming Casper, WY	Citadel Energy Houston, TX
Marston & Marston St. Louis, MO	Kenneth R. Paulsen Consulting Arvada, CO	Citation 1994 Investment Ltd Partnership Houston, TX
Burns & McDonnell Kansas City, MO	Western Fuels Association Lakewood, CO	DL Cook Dallas, TX
Ark Land Company Fairview, IL	ABO Petroleum Corporation Artesia, NM	Coral Petroleum Ltd Corvallis, OR
Shea & Gardner Washington, D.C.	Adam & Company Miami, FL	Jacob Land & Livestock Co. Oklahoma City, OK
ECC Casper, WY	American Exploration Company Houston, Texas	

Table 5-3 (cont'd)

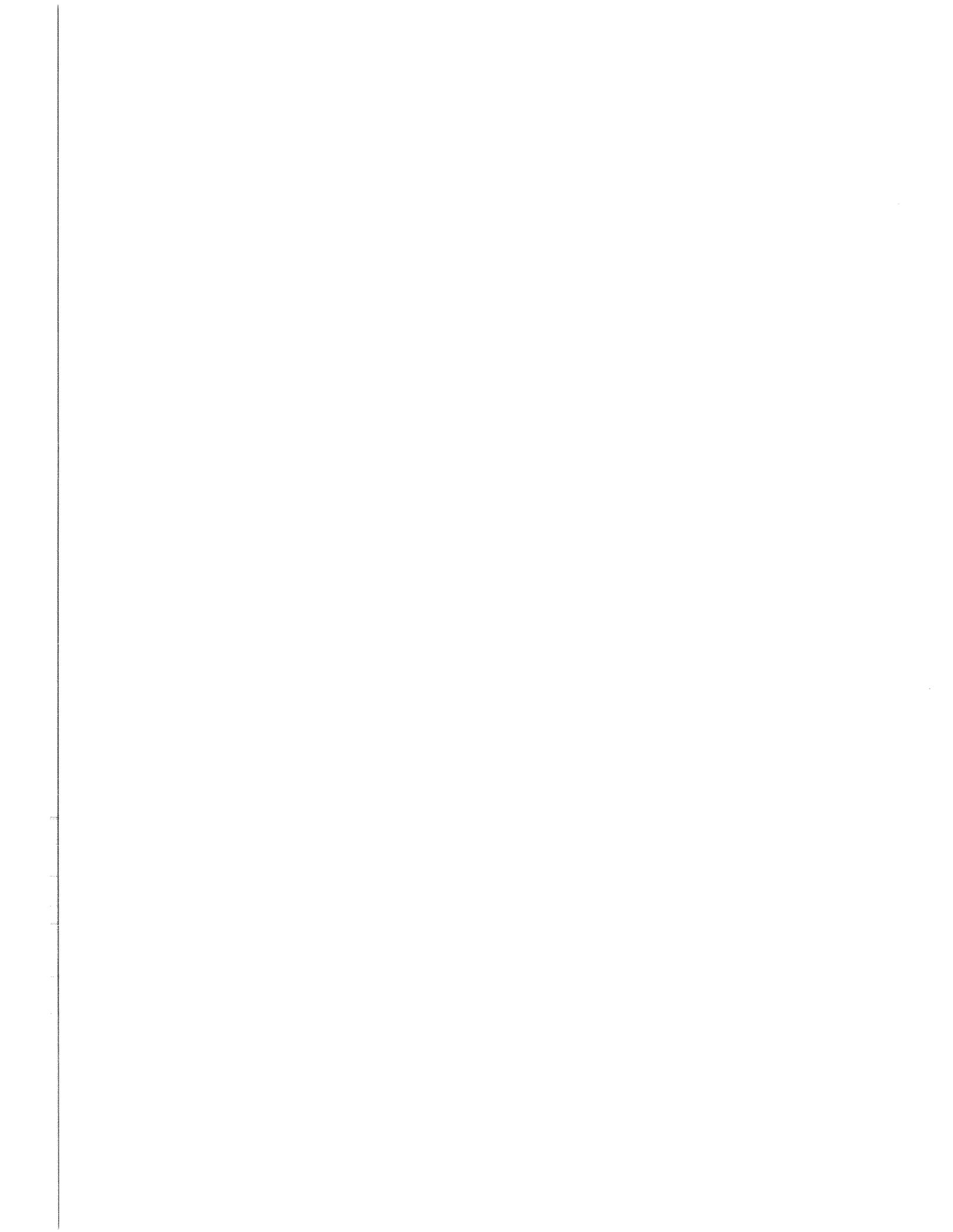
	Key Production Co. Denver, CO	Phillips Petroleum Co. Bartlesville, OK
Cramer Oil Co. Denver, CO	Lowmar Exploration Co. Houston, TX	Oil Properties Association Melville, NY
Crescent Oil & Gas Corp. Denver, CO	Lyeth-Burk Partnership Englewood, CO	Scorpio Resources Inc Denver, CO
Davis Oil Co. Denver CO	Enercor Inc. Gillette, WY	Sport Resources Inc Denver, CO
Daven Corp. Denver, CO	Malibu Presbyterian Church Malibu, CA	States Inc. Breckenridge, TX
Entergy Services, Inc. New Orleans, LA	Marathon Oil Co Houston, TX	Torch Energy Houston, TX
Exeter Exploration Co. Denver, CO	GPM Gas Corp. Oklahoma City, OK	Talala Corp. Tulsa, OK
Geotech Production Co. Aurora, CO	Maxum Exploration Co. Dallas, TX	Tindall Operating Co. Englewood, CO
Global Natural Resources Corp. of Texas Houston, TX	Miller Investment Trust Miami, FL	Turnercrest Ranch Gillette, WY
Green Ribbon, Inc. St. Thomas, Virgin IS.	Murio Oil & Royalty Co. Fort Worth, TX	US National Bank of Oregon Portland, OR
Harry W. Keeline Ranch Co. Newcastle, WY	US West Communication Denver, CO	Vale & Co. New York, NY
Headington Investments Inc. Dallas, TX	Myco Industries Inc. Artesia, NM	Valso Investment Co. New York, NY
Equitable Resources Energy Co. Balcron Oil Division Billings, MT	North Central Casing Pullers Inc. Graham, TX	Viking Resource Corp. North Canton, OH
Tom Brown Inc. Midland TX	Nova Petroleum Denver, CO	Wellstar Corp. Platteville, CO
Independent Oil Field Supply Denver, CO	Pacific Enterprises Oil Co. Dallas, TX	Wilkinson & Co. Lander, WY
Intestate Investment Co. New York, NY	Pacific Power & Light Co. Portland, OR	Winco Petro Corp. Denver, CO
Interstate Investments Miami, FL	Western Production Co. Rapid City, SD	ZAB Inc. Denver, CO
ITR Petroleum Inc. Houston, TX	Peabody Development Co. St. Louis, MO	Zalman Resources Inc. Denver, CO
JBD Associates Miami Beach, FL	Pennzoil Exploration & Production Houston, TX	D&D Resources Grand Junction, CO
Kaiser-Francis Oil Tulsa, OK	Pepperdine University Malibu, CA	<u>Interest Groups & Professional Societies</u>
	Petroleum Inc. Wichita, KS	Powder River Basin Resource Council Sheridan, WY

5.0 Consultation and Coordination

Table 5-3 (cont'd)	Wyoming Wool Growers Association Casper, WY	Richard D. Amber Job's Town, NJ
Wyoming Outdoor Council Lander, WY	Petroleum Association of Wyoming Casper, WY	Scott Benson Gillette, WY
Sierra Club Sheridan, WY	Wyoming Multiple Use Coalition Casper, WY	Sheldon Bierman Washington Grove, MD
Audubon Society Casper, WY Cheyenne, WY Sheridan, WY	Wind River Multiple Use Advocates Riverton, WY	Larry B. Barnes Boise, ID
Friends of the Bow/ Biodiversity Associates Laramie, WY	Institute for Policy Research Northwestern University Evanston, IL	K.M. Blake Santa Monica, CA
Foundation for North American Wild Sheep Cody, WY	Individuals	Joyce R. Carlson Cheyenne, WY
Wyoming Association of Professional Archaeologists Casper, WY Laramie, WY	Jim Nyenhuis Fort Collins, CO	Deborah Humphrey Cass Arlington, TX
Wyoming Mining Association Cheyenne, WY	Nicholas Wylie Madison, WI	Alan T. Christie White Plains, NY
Wyoming Heritage Society Casper, WY	Ralph Barbero Arlington, VA	Jolene A. Cogil Lakewood, CO
Wyoming Geological Association Casper, WY	Mark Winland Gillette, WY	Robert L. Dale Saratoga, CA
Medicine Wheel Alliance Huntley, MT	Shawn G. Grindstaff Farmington, MO	Larry Delzell Plano, TX
National Mining Association Washington, D.C.	Bill Saulcy Encampment, WY	James A Devlin Darien, CT
Sinapu Boulder, CO	Arnold Cunningham Laramie, WY	Michael R. Diefenderfer Englewood, CO
The Greens/Green Party USA Chicago, IL	Ladd Frary Grand Junction, CO	John C. & Betty J. Dilts Douglas, WY
Wyoming Wildlife Federation Cheyenne, WY	John Williams Portland, OR	Charles Evans New York, NY
The Nature Conservancy Laramie, WY	Dan E. Tracy, et al. Gillette, WY	Vernon R. Drwenski Casper, WY
Wyoming Stock Growers Association Cheyenne, WY	Asa Reed Longmont, CO	J. P. Gibbons Salt Lake City, UT
Thunder Basin Grazing Association Douglas, WY	Dave Shippy Gillette, WY	Elizabeth Goodnough Gillette, WY
Inyan Kara Grazing Association Newcastle, WY	Ted Olson Salt Lake City, Utah	Duane Haefel Douglas, WY
	John Pexton Douglas, WY	James Hageman Ft. Laramie, WY
	Cecil Cundy Sundance, WY	Nancy Higgins Denver, CO

Table 5-3 (cont'd)

	Omaha, NE	John S. Wold Casper, WY
Ken Henderson Cos Cob, CT	John C. Oxley Tulsa, OK	O. Dale Wright Denver, CO
J.A. & Winifred C. Humphrey Trust Dallas, TX	Peggy Peterson Casper, WY	Dennis W. Yockim Williston, ND
James Irish Irish Family Trusts Dallas, TX	Robert S. Puder South Orange, NJ	Dennis Young North Salt Lake City, UT
Irving R. & Hilde Deemar Morton Grove, IL	Earl Reed Douglas, WY	<u>Libraries</u> The Libraries Colorado State University Fort Collins, CO
George V. Janzen El Paso, TX	Donald Springen Montrose, AL	University of Wyoming Libraries Laramie, WY (2 copies)
Ollie M. Kane Gillette, WY	O.L. Rickard Parker, CO	<u>Media</u> Coal Transportation Report Washington, D.C.
M. John Kennedy Gillette, WY	G. J. Robertson Houston, TX	Gillette News-Record Gillette, WY
Harold Kentta Casper, WY	Richard J. Rogers Jr. Sheridan, WY	Rocky Mountain Oil Journal Denver, CO
Emily Krorosz Denver, CO	Irvin Rubenstein Englewood, CO	Western Coal Newsletter Knoxville, TN
Lane Lasrich Sandy, UT	Bill D. Saxon Winter Park, FL	Cheyenne-Wyoming Eagle Cheyenne, WY
Pat Litton Gillette, WY	Robert W. Scott Golden, CO	Associated Press Cheyenne, WY
Gene Litton etux Gillette, WY	Craig Shanor Casper, WY	Casper Star-Tribune Casper, WY
Tom Mills Wright, WY	F.L. Shogrin Longmont, CO	The Douglas Budget Douglas, WY
William B. Mackey Sheridan, WY	Russell A. Spencer Denver, CO	
F. L. Natta Lexington, KY	Rupert H. Stanley/ Carrie M. Sullivan/ Buck Family Trust Littleton, CO	
Dennis Mackey Sauble Miami, FL	Velma & Donald Steckley Douglas, WY	
Rose T. Macy Longmont, CO	Patricia L. Thompson Littleton, CO	
Louis S. Madrid Denver, CO	Deena J. Wangler Douglas, WY	
John A Masek Denver, CO	Jerry & Rhonda Wilkinson Gillette, WY	
Gladys K. Norwood Attn: Lucille Flynn		



6.0 REFERENCES CITED

- Amax Coal Co., 1989 Eagle Butte Mine Permit to Mine Application 428-T2 on file with the WDEQ/LQD, Sheridan, Wyoming.
- Avian Power Line Interaction Committee, 1994, Mitigating Collisions with Powerlines: The State of the Art in 1994. Edison Electric Institute. Washington, D.C., 78 pp. + append.
- Breckenridge, R.M., Glass, G.B., Root, F.K. and Wendell, W.G., 1974, Geologic Map Atlas and Summary of Land, Water, and Mineral Resources, Geological Survey of Wyoming, County Resource Series No. 3.
- Budai, C.M. and M.L. Cummings, 1984, Geologic controls of coal burns and oxidized zones in the Antelope Coal Field, Converse County, Wyoming: in *Symposium on the Geology of Rocky Mountain Coal, Proceedings*: North Dakota Geological Society, Publication 84-1, pp. 168-183.
- Bureau of Land Management, 1974, Final Environmental Impact Statement, Eastern Powder River Basin of Wyoming. U.S. Department of the Interior, Bureau of Land Management.
- _____, 1979, Final Environmental Impact Statement, Proposed Development of Coal Resources in the Eastern Powder River Wyoming. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.
- _____, 1981, Final Powder River Regional Coal Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.
- _____, 1983, Powder River Coal Summaries. U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming.
- _____, 1984b, Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region. U.S. Department of the Interior, Bureau of Land Management, State Office, Cheyenne, Wyoming.
- _____, 1985, Buffalo Resource Management Plan Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Buffalo Resource Area, Casper, Wyoming.
- _____, 1988, NEPA Handbook H-1790-1. U.S. Department of the Interior, Bureau of Land Management.
- _____, 1992a, Final Environmental Assessment for the West Black Thunder Coal Lease Application. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.
- _____, 1992b, Final West Rocky Butte Coal Lease Application Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.
- _____, 1992c, Final Environmental Assessment for the North Antelope and Rochelle Coal Lease Applications for Powder River Coal Company. U.S.

6.0 References Cited

- Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.
- _____, 1995, Final Environmental Assessment for the Antelope Coal Lease Application. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.
- _____, 1996a, Draft Economic Summary for the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.
- _____, 1996b, Draft Natural Systems Paper for the Buffalo Resource Area's Land Use Plan. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.
- _____, 1996c, Draft Environmental Consequences of Existing Management for the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.
- _____, 1996d, Draft Existing Management of the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.
- _____, 1996e, Bureau of Land Management 1996 Southern Powder River Basin Coal Leasing Study. U.S. Department of the Interior, Bureau of Land Management, State Office, Cheyenne, Wyoming.
- _____, 1996f, Coal Development Status Check Powder River Federal Coal Region Montana & Wyoming Data Tables. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.
- _____, 1996g, Draft Energy Resources Booklet for the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.
- _____, 1996h, Final Environmental Impact Statement for the North Rochelle Coal Lease Application, U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.
- _____, 1997, Draft and Final Gillette South Coal Bed Methane Project Environmental Impact Statement, U.S. Department of the Interior, Bureau of Land Management, Buffalo Resource Area, Buffalo, Wyoming.
- Campbell County Economic Development Corporation, 1993, Community Profile, Campbell County, Wyoming: Gillette/Wright. 4 pp.
- _____, 1997, Community Profile and Business Profile, Campbell County, Wyoming.
- City of Gillette, 1978, City of Gillette/Campbell County Comprehensive Planning Program. Gillette, Wyoming.
- Coates, D.A. and Naeser, C.W., 1984, Map showing fission trackages of clinker in the rochelle Hills, southern Campbell and Weston Counties, Wyoming USGS Miscellaneous Field Investigations Map I-1462, scale 1:50,000.
- Crist, M.A., 1991, Evaluation of groundwater-level changes near Gillette, northeastern Wyoming. U.S. Geological Survey, Water Resources Investigations Report 88-4196.

- Cultural Heritage Resource Office, 1996, Class III Cultural Resource Inventory of Kerr-McGee Coal Corporation Thundercloud Maintenance Tract and Buffer Zone, Campbell County, Wyoming, Volume 1 - Report Text, Maps and Files Search, by James B. Tyler, Patrick Light, and Scott M. Fitzpatrick, October 1996.
- DeBruin, R.H., 1996, Oil and gas map of Wyoming: Wyoming State Geological Survey Map Series MS-48, scale 1:500,000.
- DeBruin, R.H., and Jones, R.W., 1989, Coalbed methane in Wyoming: Guidebook on gas resources of Wyoming, pp. 97-104.
- Denson, N.M. and Pierson, C.T., 1991, Geologic map showing the thickness and structure of the Anderson-Wyodak coal bed in the north half of the Powder River Basin, southeastern Montana and northeastern Wyoming: U.S. Geological Survey Miscellaneous Investigations Map I-2094-A, scale 1:200,000.
- Denson, N.M., Dover, J.H., and Osmonson, L.M., 1978, Lower Tertiary coal bed distribution and coal resources of the Reno Junction-Antelope Creek area, Campbell, Converse, Niobrara, and Weston County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-960, scale 1:125,000.
- ENCOAL 1996, Air Quality Permit Application for the ENCOAL Coal Enhancement Facility, on file with WDEQ/AQD, Sheridan, Wyoming.
- _____, 1997, Groundwater supply and yield analysis for the ENCOAL LFC™ Plant, Water Supply Wells at North Rochelle Mine. Submitted to Wyoming State Engineer.
- Evans, D.L., E.K. Bartels, and J.S. Armbruster, 1983, Sandhill crane (*Grus canadensis*). Pages 154-169 in J.S. Armbruster (ed.). Impacts of coal surface mining on 25 migratory bird species of high federal interest. U.S. Fish and Wildlife Service, FWS/OBS-83/35. 348 pp.
- GCM Services, Inc., 1993, Class III Cultural Resource Inventory of Tract B adjacent to Rochelle and Antelope Mines, Campbell County Wyoming. Report prepared for Powder River Coal Company.
- Gillette News Record, 1996a, "Hunting proposals call for big cuts", Kathy Brown, March 27.
- Gillette News Record, 1996b, "Big projects could bring local boom", Deb Holbert, December 18.
- Gillette News Record, 1997, "Gillette population takes a downswing", Valerie Kiger, December 11.
- Glass, G.B., 1976, Update on the Powder River Coal Basin: Wyoming Geological Association 28th Annual Field Conference Guidebook, R.B. Laudon ed.
- Glass, G.B. and R.W. Jones, 1992, Coal fields and coal beds of Wyoming, Geological Survey of Wyoming Reprint No. 47 (originally published in the Wyoming Geological Association, Forty-second (Annual) Field Conference Guidebook, 1991).

6.0 References Cited

- Hadley, R.F. and Schumm S.A., 1961, Sediment sources and drainage basin characteristics in Upper Cheyenne River Basin, United States Department of Interior, U.S. Geological Survey Water Supply Paper 1531-B.
- Hanley, J.H., 1976, Paleosynecology of Nonmarine Mollusca from the Green River and Wasatch Formations (Eocene) Southwestern Wyoming and Northwestern Colorado: in *Structure and Classification of Paleocommunities*, by R.W. Scott and R.R. West. pp. 235-261. Dowden, Hutchinson and Ross, Inc.
- Houghton R.L., D.L. Fisher, and G.H. Groenewold, 1987, Hydrogeochemistry of the Upper Part of the Fort Union Group in the Gascoyne Lignite strip-mining area, North Dakota. U.S. Geological Survey Professional Paper 1340. 104 pp.
- Hydro-Engineering, 1991a, GAGMO 1991 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.
- _____, 1991b, GAGMO 10-year Report. Prepared for Gillette Area Groundwater Monitoring Organization.
- _____, 1992, GAGMO 1992 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.
- _____, 1993, GAGMO 1993 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.
- _____, 1994, GAGMO 1994 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.
- _____, 1995, GAGMO 1995 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.
- _____, 1996a, GAGMO 15-year Report. Prepared for Gillette Area Groundwater Monitoring Organization.
- _____, 1996b, 1996 GAGMO Annual Report. Prepared for Gillette Area Groundwater Monitoring Organization.
- Kerr-McGee Coal Corporation, Jacobs Ranch Mine, WDEQ/LQD Annual Mine Reports, Submitted to the Wyoming Department of Environmental Quality/Land Quality Division, 1980-1996.
- _____, 1994, Jacobs Ranch Mine Permit to Mine Application 271-T3 on file with WDEQ/LQD, Sheridan, Wyoming.
- _____, 1995, Lease-by-application for the Thundercloud Maintenance Tract, prepared by KMCC April 5, 1995.
- Law, B.E., 1976, Large-scale compaction structures in the coal-bearing Fort Union and Wasatch Formations, northeast Powder River Basin, Wyoming: in *Wyoming Geological Association: Guidebook on geology and energy resources of the Powder River Basin*, pp. 221-229.
- Law, B.E., D.D. Rice, and R.M. Flores, 1991, Coalbed gas accumulations in the Paleocene Fort Union Formation. Powder River Basin, Wyoming: in *Coalbed Methane of Western North America: Guidebook for the Rocky Mountain Association of Geologists fall conference and field trip*, Stephen D. Schwochow ed.

- Lewis, B.D. and W.R. Hotchkiss, 1981, Thickness, percent sand, and configuration of shallow hydrogeological units in the Powder River Basin, Montana and Wyoming. U.S. Geological Survey Miscellaneous Investigation Series Map I-1317.
- Mariah Associates, Inc., 1990, Paleontological survey of areas adjacent to the Rochelle and North Antelope Mines, Campbell County, Wyoming. Prepared for Powder River Coal Company, Gillette, Wyoming, by Gustav Winterfeld, Ph.D., Principal Investigator, under Federal Antiquities Permit #137-WY-PA90, April 1990.
- _____, 1990, A class III cultural resource inventory of areas adjacent to the Rochelle Mine. Report prepared for Powder River Coal Company.
- _____, 1991, A class III cultural resource inventory of areas adjacent to the Rochelle and North Antelope Mines. Report prepared for Powder River Coal Company.
- Martin, L.J., D.L. Naftz, H.W. Lowham, and J.G. Rankl, 1988, Cumulative potential hydrologic impacts of surface coal mining in the eastern Powder River Structural Basin, northeastern Wyoming (CHIA). U.S. Geological Survey, Water Resources Investigations Report 88-4046. Prepared in cooperation with Wyoming Department of Environmental Quality and U.S. Office of Surface Mining, Cheyenne, Wyoming.
- Martner, B.E., 1986, Wyoming Climate Atlas. Prepared in cooperation with the Wyoming Water Research Center, University of Wyoming.
- Mine Safety and Health Administration, 1997, 645 Database, Wyoming Summary Employment and Injury Information.
- National Oceanic and Atmospheric Administration, 1969, Climatology of the United States: Asheville, North Carolina, National Climatic Center, Climatological Summaries, No. 20-48.
- North American Power Group, 1996, Permit Application for Two-Elk Generation Partners, submitted to WDEQ for review. Prepared by TRC Environmental Corporation.
- North East Wyoming Economic Development Coalition (NEWEDC), 1997, Converse County Community Profile.
- Oakleaf, B., B. Luce, S. Ritter, and A. Cerovski, 1992, Wyoming bird and mammal atlas. Wyoming Game and Fish Department, Cheyenne, Wyoming. 170 pp.
- Oedekoven, O.O., 1994, Distribution, habitat use, and population dynamics of the Rochelle Hills elk herd, Final Report, Wyoming Game and Fish Department, Gillette, Wyoming.
- Office of Surface Mining Reclamation and Enforcement, 1980, Noise impact assessment for Rojo Caballo Mine. Unpublished Report prepared by James M. Montgomery, Consulting Engineers, Inc. Aurora, Colorado.
- _____, 1982, Proposed Mining and Reclamation Plan EIS, North Rochelle Mine, Campbell County, Wyoming. U.S. Department of Interior, Denver, Colorado.

6.0 References Cited

- _____, 1984, Correlation and effect of mine facility wells on the Tullock Aquifer in the Gillette, Wyoming, vicinity. Prepared by G.E. McIntosh, C.A. Harrison, and J.V. Wilcox.
- Olive, W.W., 1957, The Spotted Horse Coalfield, Sheridan and Campbell Counties, Wyoming: U.S. Geological Survey Bulletin 1050.
- Peacock, Kenneth, 1997, Assessing the Cumulative Impacts of Surface Mining and Coal Bed Methane Development on Shallow Aquifers in the Powder River Basin, Wyoming. Proceedings: American Society for Surface Mining and Reclamation, 14th Annual National Meeting, Austin, Texas, edited by Brandt, J.E., J.R. Galetovic, L. Kost, and J. Trouart, p. 667-676.
- Planning Information Corporation, 1997, ENCOAL Corporation WISD Request for Waiver of Permit Application, prepared for ENCOAL Corporation.
- Powder River Coal Company, 1994a, North Antelope Mine Permit to Mine Application 532-T4 on file with WDEQ/LQD, Cheyenne, Wyoming.
- _____, 1994b, Rochelle Mine Permit to Mine Application 569-T4, on file with the WDEQ/LQD, Cheyenne, Wyoming.
- _____, 1994c, North Antelope Mine Air Permit Application MD-143, on file with WDEQ/AQD, Sheridan, Wyoming.
- _____, 1995, Lease-by-application for the Powder River Maintenance Tract, prepared by PRCC March 23, 1995.
- _____, 1996, Alluvial Valley Floor Investigations Within and Adjacent to the North Antelope Mine: Addendum D11-1 to Permit to Mine Application 532-T4 on file with the WDEQ/LQD, Cheyenne, Wyoming.
- Powder River Eagle Studies (PRES), 1996, Porcupine Creek Wildlife Baseline Report. Prepared for Powder River Coal Company, Gillette, Wyoming. Revised November 1996.
- _____, 1997, Personal communication with Howard Postovit.
- Rehm, B.W., G.H. Groenewold, and K.A. Morin, 1980, Hydraulic properties of coal and related materials, Northern Great Plains: Groundwater, v. 18, no. 6, pp. 551-561.
- Remington, T.E., and C.E. Braun, 1991, How surface coal mining affects sage grouse, North Park, Colorado. Pages 128-132 in *R.D. Comer, P.R. Davis, S.Q. Foster, C.V. Grant, S. Rush, O. Thorne, II, and J. Todd (eds.), Proceedings V: Issues and technology in the management of impacted wildlife.* Thorne Ecological Institute, Boulder, Colorado.
- State of Wyoming, 1987, Investigation of the potential for explosive concentrations of methane to be located at or near-surface in the Rawhide Village/Horizon Subdivision, Campbell County, Wyoming: Office of the Governor, Wyoming Department of Environmental Quality/Land Quality Division, and Wyoming Geological Survey, July 29, 1987.
- Sundstrom, C.W., G. Hepworth, and K.L. Diem, 1973, Abundance, distribution and food habits of pronghorn. Wyoming Game and Fish Commission,

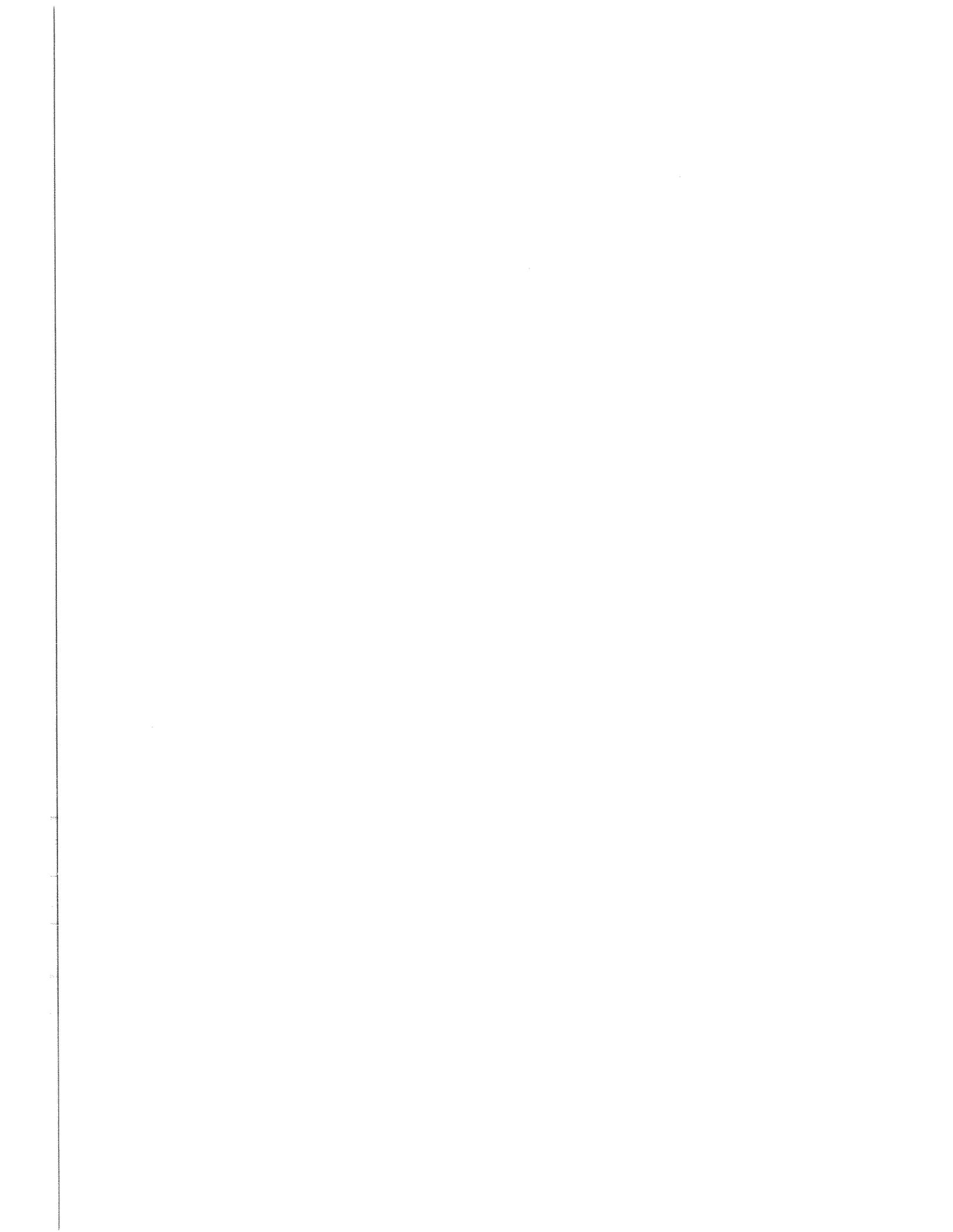
- Bull. No. 12. Cheyenne, Wyoming, 51 pp.
- Taylor, D., 1975, Early Tertiary Mollusks from the Powder River Basin, Wyoming and Adjacent Areas. U.S. Geological Survey Open File Report 75:331-507.
- Thunder Basin Coal Company, Black Thunder Mine WDEQ/LQD Annual Mine Reports, 1980-1996, Submitted to the Wyoming Department of Environmental Quality/Land Quality Division.
- _____, 1993, Black Thunder Mine WDEQ/LQD State Program permit Application 233-T5, on file with WDEQ/LQD, Cheyenne, Wyoming.
- _____, 1996, Air Permit Application for Black Thunder Mine, on file with WDEQ/AQD, Sheridan, Wyoming.
- U.S. Army Corps of Engineers, 1987, Corps of Engineers Wetlands Delineation Manual, by the Environmental Laboratory, Department of the Army, Waterways Experiment Station.
- U.S. Bureau of the Census, USA Counties 1996 CD-ROM.
- U.S. Fish & Wildlife Service, 1996, Memorandum from Charles P. Davis to BLM Casper District Manager on Powder River Coal Co. and Kerr-McGee Coal Corp. LBAs. Written communication, October 17, 1996.
- U.S. Forest Service, 1985, Land and Resource Management Plan, Medicine Bow National Forest and Thunder Basin National Grassland, USDA Forest Service, October 1985.
- U.S. Geological Survey, 1995, 1995 National Assessment of United States Oil and Gas Resources Circular 1118.
- University of Wyoming, 1994, Economic Impact of Coal on Wyoming's Economy. Cooperative Extension Service, Department of Agricultural Economics, College of Agriculture. B-987.
- Wyoming Coal Information Committee, 1997, A Concise Guide to Wyoming Coal.
- Van Voast, W.A and Reiten, J.C., 1988, Hydrogeologic response--twenty years of surface coal mining in southeastern Montana: Montana Bureau of Mines and Geology Memoir 62.
- Vogler, P.D., L.L. Larson, and K.T. Mehring, 1995, A review of Wyoming's coal mines and markets: 1994. Wyoming State Geological Survey, Coal Report 95-1.
- Watson, Mark, 1996, Personal and FAXed communication, Wyoming Oil and Gas Conservation Commission, November 1996.
- Wilson, R., 1994, Pages 10-11 in Wyoming Wildlife News, Vol. 4, No. 3, Wyoming Game and Fish Department.
- Wyoming Department of Commerce, Energy Section, 1997, personal communication with Ed Schmidt.
- Wyoming Department of Employment, Research and Planning, 1997, Wyoming Labor Force Statistics.
- Wyoming Department of Environmental Quality, 1979, Fugitive Dust Emission

6.0 References

- Factors. Charles A. Collins and Randolph Wood, Wyoming Department of Environmental Quality, Air Quality Division. Memorandum of January 24, 1979.
- _____, 1989, Report on Air Quality Monitoring in Wyoming's Powder River Basin, 1980-1988.
- _____, 1989-1994, Air Quality Monitoring Data on file in WDEQ offices in Cheyenne, Wyoming.
- _____, Land Quality Division, 1996, Guideline No. 17, Permanent Postmining Impoundments.
- Wyoming Department of Game and Fish, 1995, District 3 Annual Big Game Herd Unit Reports, Wyoming Game and Fish Department, Cheyenne, Wyoming.
- _____, 1996, Wildlife Observation System, Wyoming Game and Fish Dept. Publ., Cheyenne, Wyoming.
- Wyoming Employment Resources Division, Research and Planning, July 1997, Wyoming Labor Force Trends.
- Wyoming State Engineer's Office, 1991, Tabulation of Groundwater Rights.
- Wyoming State Geological Survey, 1996, Wyoming Geo-notes, No. 52, 59pp.
- _____, 1997, No. 54, 66pp.
- Ziegler Coal Holding Company, August 29, 1997, Press release regarding ENCOAL plant.

APPENDIX A

**FEDERAL AND STATE PERMITTING
REQUIREMENTS AND AGENCIES**



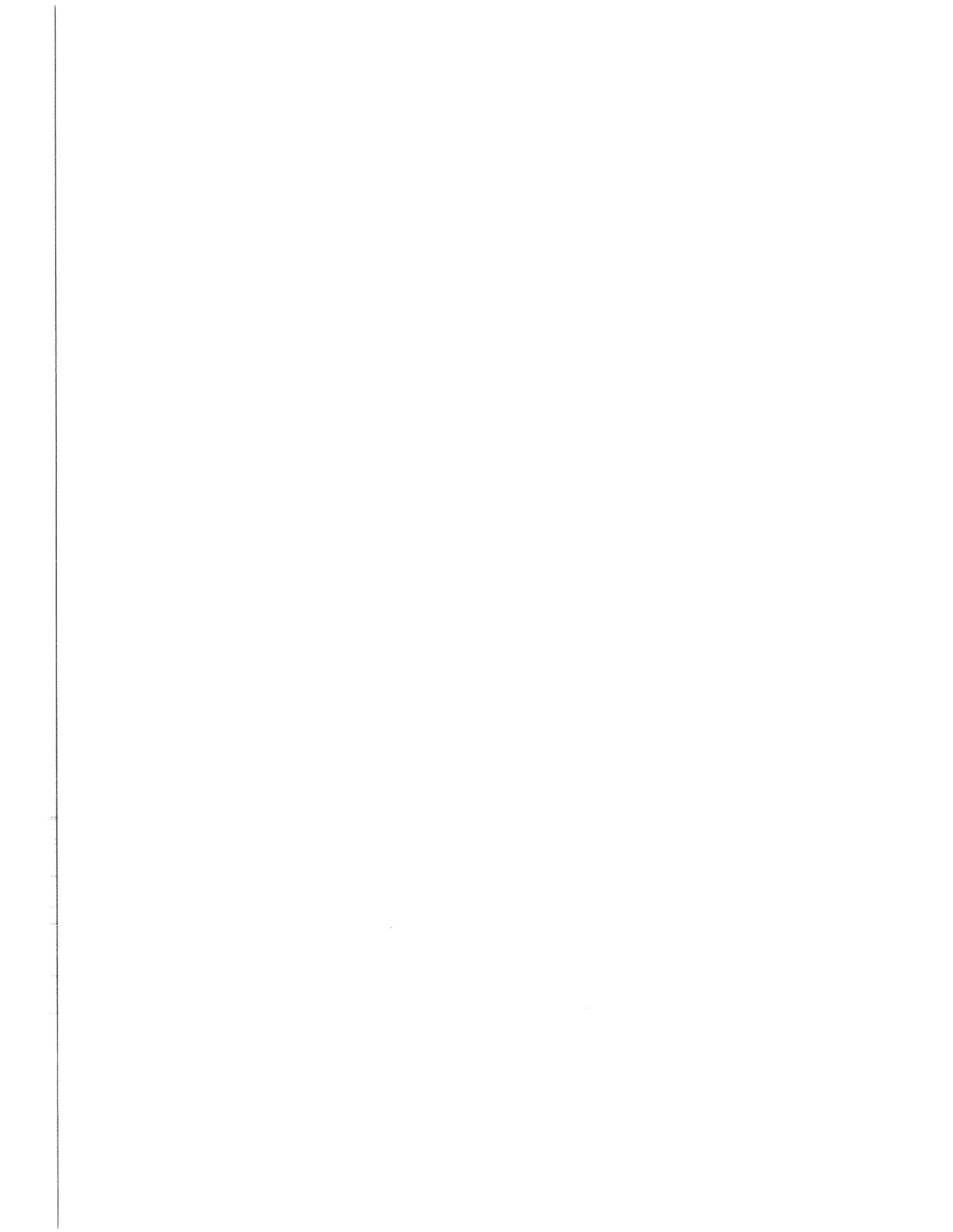
Appendix A. Federal and State Permitting Requirements and Agencies

AGENCY	LEASE/PERMIT/ACTION
FEDERAL	
Bureau of Land Management	Coal Lease Resource Recovery and Protection Plan Scoria Sales Contract Exploration Drilling Permit
Forest Service	Special Use Permits Contract for Sale of Mineral Materials
Office of Surface Mining Reclamation and Enforcement	Mining Plan Approval Document Preparation SMCRA Oversight
Department of the Interior	Mining Plan Approval
Mine Safety and Health Administration	Safety Permit and Legal I.D.
Bureau of Alcohol, Tobacco and Firearms	Explosives Manufacturer's License Explosives Use and Storage Permit
Federal Communication Commission	Radio Permit: Ambulance Mobile Relay System Radio License
Nuclear Regulatory Commission	Radioactive By-products Material License
Army Corps of Engineers	Authorization of Impacts to Wetlands & Other Waters of the U.S.
Environmental Protection Agency	Hazardous Waste I.D. Number
Department of Transportation	Hazardous Waste Shipment Notification
Federal Aviation Administration	Radio Tower Permit
STATE	
State Land Commission	Coal Lease Scoria Lease
Department of Environmental Quality-Land Quality Division	Permit and License to Mine
Department of Environmental Quality-Air Quality Division	Air Quality Permit to Operate; and Air Quality Permit to Construct
Department of Environmental Quality-Water Quality Division	National Pollutant Discharge Elimination System Water Discharge Permit Discharge Permit Permit to Construct Sedimentation Pond Authorization to Construct Septic Tank & Leach Field Authorization to Construct and Install a Public Water Supply and Sewage Treatment System
Department of Environmental Quality-Land Quality Division	Solid Waste Disposal Permit-Permanent and Construction
State Engineer's Office	Appropriation of Surface Water Permits Appropriation of Groundwater Permits
Industrial Siting Council	Industrial Siting Certificate of Non-Jurisdiction
Department of Health	Radioactive Material Certificate of Registration



APPENDIX B

**UNSUITABILITY CRITERIA FOR THE
POWDER RIVER LBA TRACT AND THUNDERCLOUD LBA TRACT**



Appendix B. Unsuitability Criteria for the Powder River LBA Tract and Thundercloud LBA Tract

UNSUITABILITY CRITERIA	FINDINGS FOR THUNDER BASIN NATIONAL GRASSLAND (TBNG) STUDY AREA (USFS, 1985)	VALIDATION FOR POWDER RIVER AND THUNDERCLOUD LBA TRACTS
1. Federal Land Systems. With certain exceptions that do not apply to these tracts, 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.	TBNG is not part of a national forest and none of the other listed federal lands categories are present within the study area.	None of the listed federal lands are present on the Powder River or Thundercloud LBA tracts, and the tracts are therefore 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.	TBNG contains two rights-of-way that meet the intent of this criterion: BN railroad and the Tri-County 230 Kv transmission line.	The Tri-County 230 Kv transmission line is not on either of the LBA tracts. The BN/C & NW right-of-way is on a portion of the Thundercloud LBA tract. This right-of-way was designated unsuitable for mining in the TBNG Land and Resource Management Plan. The lease will be stipulated to exclude mining within the railroad right-of-way.
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.	Within TBNG, a school at Wilkinson Ranch headquarters, Wyoming State Highway 59, and 5 ranch headquarters were found to meet the intent of this criterion	None of the listed rights-of-way or buildings are on either LBA tract, and the Powder River and Thundercloud LBA tracts are therefore 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 within TBNG review area are within a wilderness study area.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 on TBNG meet the scenic criteria as outlined.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 TBNG review area are under permit except small enclosures being used to gage reclamation success on existing mines.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 TBNG review area.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are not unsuitable for mining.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the TBNG are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 criterion for T or E plant or animal species within the TBNG review area.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 Powder River and Thundercloud LBA tracts are not unsuitable for mining.
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 either tract. There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are not unsuitable for mining.

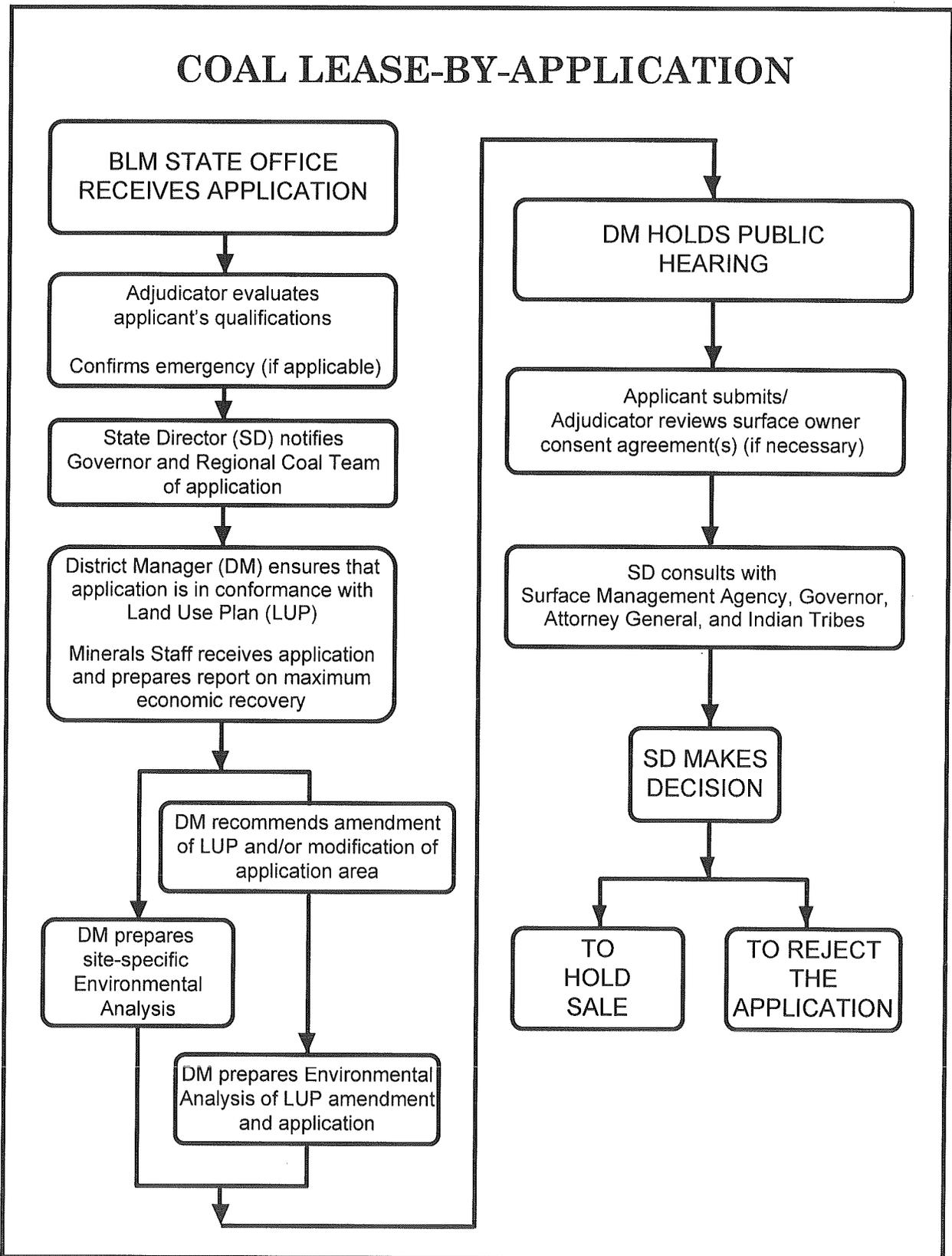
Appendix B

UNSUITABILITY CRITERIA	FINDINGS FOR THUNDER BASIN NATIONAL GRASSLAND (TBNG) STUDY AREA (USFS, 1985)	VALIDATION FOR POWDER RIVER AND THUNDERCLOUD LBA TRACTS
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 on the TBNG 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 TBNG review area.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 the U.S. Fish and Wildlife Service (USFWS), it was determined that this criterion does not apply in TBNG.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 consultation with the USFWS, it was determined that this criterion does not apply in TBNG.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 Powder River and Thundercloud LBA tracts are 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 U.S. Geological Survey, 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 TBNG review area are not unsuitable for mining.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 TBNG review area.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 within the TBNG review area.	There are no unsuitable findings, and the Powder River and Thundercloud LBA tracts are 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 either LBA 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 unsuitable findings for this criterion on either LBA tract.

APPENDIX C

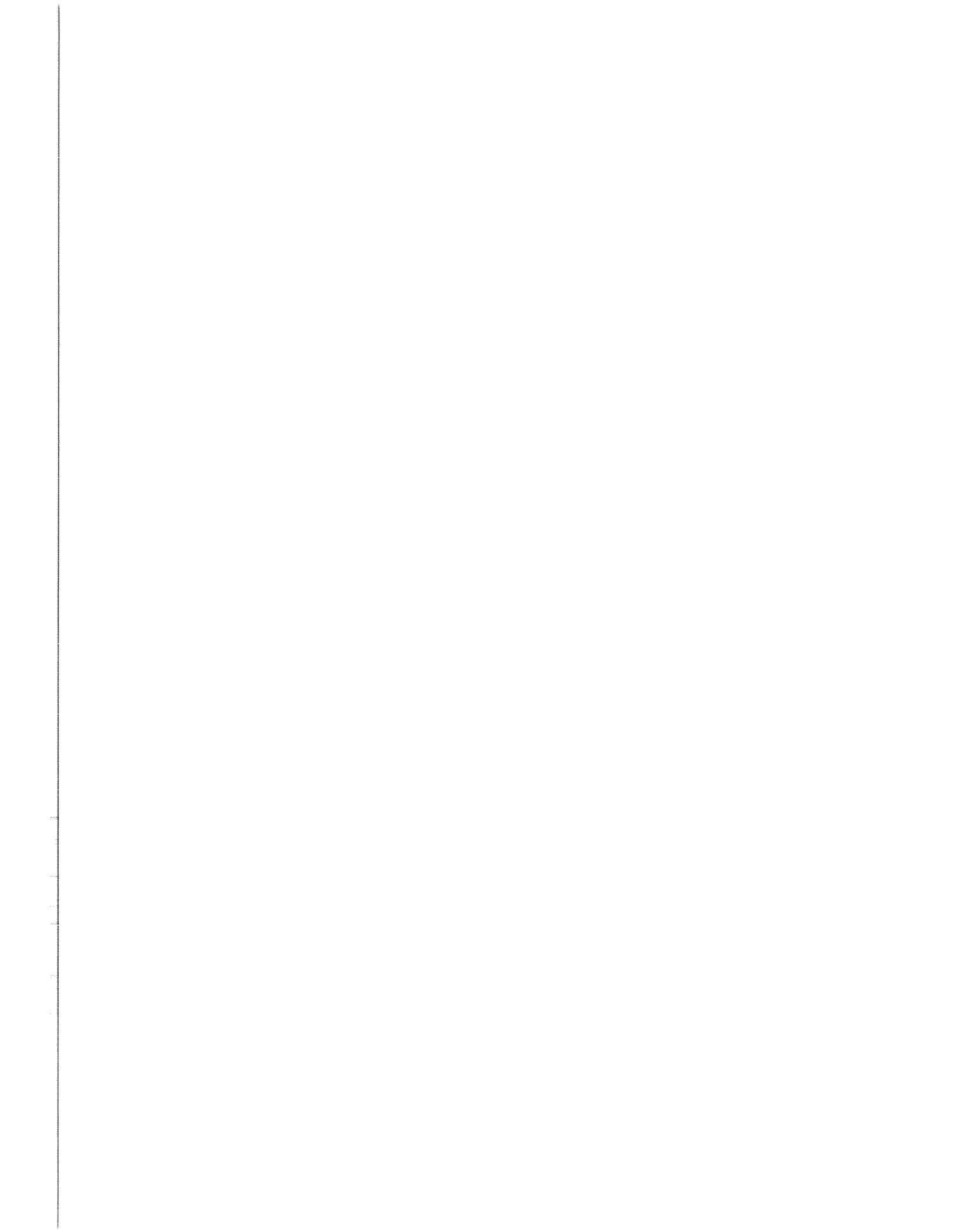
**COAL LEASE-BY-APPLICATION
FLOW CHART**





APPENDIX D

**BLM SPECIAL COAL LEASE STIPULATIONS,
FOREST SERVICE STIPULATIONS,
AND
FORM 3400-12 COAL LEASE**



SPECIAL COAL LEASE STIPULATIONS

In addition to observing the general obligations and standards of performance of current regulations, the lessee shall comply with and be bound by the following stipulations. These stipulations are also imposed on the lessee's agents and employees. Failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. The lessee shall require agents, contractors, and subcontractors involved in activities concerning this lease to include these stipulations in the contracts between and among them. These stipulations may be revised or amended, in writing, by the mutual consent of the lessor and the lessee at any time, to adjust to changed conditions or to correct an oversight.

CULTURAL RESOURCES

- (1) Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specified by the authorized office of the Bureau of Land Management (BLM) or of the surface managing agency, if different, on portions of the mine plan area and adjacent areas or exploration plan area that may be adversely affected by lease-related activities and which were not previously inventoried at the required level of intensity. The cultural resources inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archeologist, historian, or historical architect, as appropriate) and authorized officer (AO) of the surface managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protection of any cultural resources identified shall be submitted to the Assistant Director of the Western Support Center of the Office of Surface Mining, the BLM AO (if activities are associated with the coal exploration outside an approved mining permit area) and the AO of the surface managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Assistant Director or AO to protect cultural resources on the lease lands. The lessee shall not commence the surface-disturbing activities until permission to proceed is given by the Assistant Director or AO.
- (2) The lessee shall protect all cultural resource properties within the lease area from lease-related activities until the cultural resource mitigation measures can be implemented as part of an approved mining and reclamation plan or exploration plan.
- (3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.
- (4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Assistant Director or AO of the surface managing agency. The lessee shall not disturb such resources except as may be subsequently authorized by the Assistant Director or AO. Within two working days of notification, the Assistant Director or AO will evaluate or have evaluated any cultural resources discovered and will

determine if any action is required to protect or preserve such discoveries. The cost of data recovery for cultural resources during lease operations shall be borne by the surface managing agency unless otherwise specified by the BLM AO or the surface managing agency AO (if different).

- (5) All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.

PALEONTOLOGICAL RESOURCES

If a paleontological resource, either large and conspicuous and/or of significant scientific value, is discovered during any surface-disturbing activities, the find will be reported to the AO immediately. Surface-disturbing activities will be suspended within 250 ft of said find. An evaluation of the paleontological discovery will be made by a BLM-approved professional paleontologist within five working days, weather permitting, to determine the appropriate action(s) and prevent the potential loss of any significant paleontological value. Operations within 250 ft of such a discovery will not be resumed until written authorization to proceed is issued by the AO. The lessee will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant interest discovered during the operation.

OIL AND GAS RESOURCES

The BLM realizes that coal mining operations conducted on leases issued within producing oil and gas fields may interfere with the economic recovery of oil and gas; just as oil and gas leases issued in a coal lease may inhibit coal

production. BLM retains complete authority to alter and/or modify coal operations or oil and gas operations on lands covered by federal leases so as to obtain maximum resource recovery of either or both resources with due regard to valid existing rights.

RESOURCE RECOVERY AND PROTECTION

Any proposed bypass of federal coal determined to be economically recoverable must have the written approval of the BLM AO in the form of an approved modification to the Resource Recovery and Protection Plan (R2P2) prior to the federal coal being bypassed (43 CFR 3482.2[c][2]). Failure to comply with this requirement shall result in the issuance of a Notice of Noncompliance by the AO. The Notice of Noncompliance will include the amount of damages to be assessed for the unauthorized bypass of federal coal as determined by the AO. The amount of damages, at a minimum, will be the amount of royalty to be assessed as determined by the AO to compensate the federal government for the unauthorized bypass federal coal.

PUBLIC LAND SURVEY PROTECTION

The lessee will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during operations on the lease area. If any monuments, corners or accessories are destroyed, obliterated, or damaged by this operation, the lessee will hire an appropriate county surveyor or registered land surveyor to re-establish or restore the monuments, corners, or accessories at the same location, using surveying procedures in accordance with the *Manual of Surveying Instructions for the Survey of Public Land of the United States*.

The survey will be recorded in the appropriate county records, with a copy sent to the AO.

RAILROAD RIGHT-OF-WAY

No mining activity of any kind may be conducted within the Burlington Northern/Chicago and Northwestern railroad right-of-way. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing right-of-way. Lessee shall pay all royalties on any legally and economically recoverable coal which it fails to mine without the written permission of the Authorized Officer.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial Number

COAL LEASE

PART I. LEASE RIGHTS GRANTED

This lease, entered into by and between the UNITED STATES OF AMERICA, hereinafter called lessor, through the Bureau of Land Management, and _____, hereinafter called lessee, is effective (date) _____, for a period of 20 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the:

- Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act of 1920;
- Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any bonuses, rents, and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

containing _____ acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances, and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1. (a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of \$ _____ for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2. (a) PRODUCTION ROYALTIES - The royalty shall be _____ percent of the value of the coal as set forth in the regulations. Royalties are due to lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of \$ _____. The authorized officer may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions shall be excused when operations under the lease are interrupted by strikes, elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations. Lessee's failure to produce in commercial quantities at the end of 10 years shall terminate the lease. Lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after lease issuance.

The lessor reserves the power to assent to or order the suspension of terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU in which this lease is a part is dissolved, the lessee shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all reasonable times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 18 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 15. SPECIAL STIPULATIONS -

Sec. 9. (a) TRANSFERS

- This lease may be transferred in whole or in part to any person or association or corporation qualified to hold such lease interest.
- This lease may be transferred in whole or in part to another public body or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.
- This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposit and place all workings in condition for suspension or abandonment. Within 130 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased land beyond 130 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface owned by third parties, lessor shall waive the requirement for removal provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of a debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS-IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereunder shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151-1175), the Clean Air Act (42 U.S.C. 1357 et. seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et. seq.).

Sec. 15. SPECIAL STIPULATIONS (Cont'd) -

THE UNITED STATES OF AMERICA

By

Company or Lessee Name

(Signature of Lessee)

(Title)

(Date)

(Signing Officer)

(Title)

(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

This form does not constitute an information collection as defined by 44 U.S.C. 3502 and therefore does not require OMB approval.

**NOTICE FOR LANDS OF THE NATIONAL FOREST SYSTEM
UNDER JURISDICTION OF
DEPARTMENT OF AGRICULTURE**

The permittee/lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the permit. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of an exploration plan by the Secretary of the Interior, (2) uses of all existing improvements, such as forest development roads, within and outside the area permitted by the Secretary of the Interior, and (3) use and occupancy of the NFS not authorized by an exploration plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed

to: District Ranger

at: 809 S. 9th Street, Douglas, WY 82633

Telephone: 307/358-4690.

who is the authorized representative of the Secretary of Agriculture.

NOTICE

CULTURAL AND PALEONTOLOGICAL RESOURCES - The Forest Service (FS) is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking the surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the FS, shall:

1. Contact the FS to determine if a site specific cultural resource inventory is required. If a survey is required, then:
2. Engage the services of a cultural resource specialist acceptable to the FS to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the FS for review and approval at the time a surface disturbing plan of operation is submitted.

3. Implement mitigation measures required by the FS and BLM to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing, salvage, and recordation of other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.

The lessee or operator shall immediately bring to the attention of the FS and BLM any cultural or paleontological resources or any other objects of scientific interest discovered as a result of surface operations under this lease, and shall leave such discoveries intact until directed to proceed by FS and BLM.

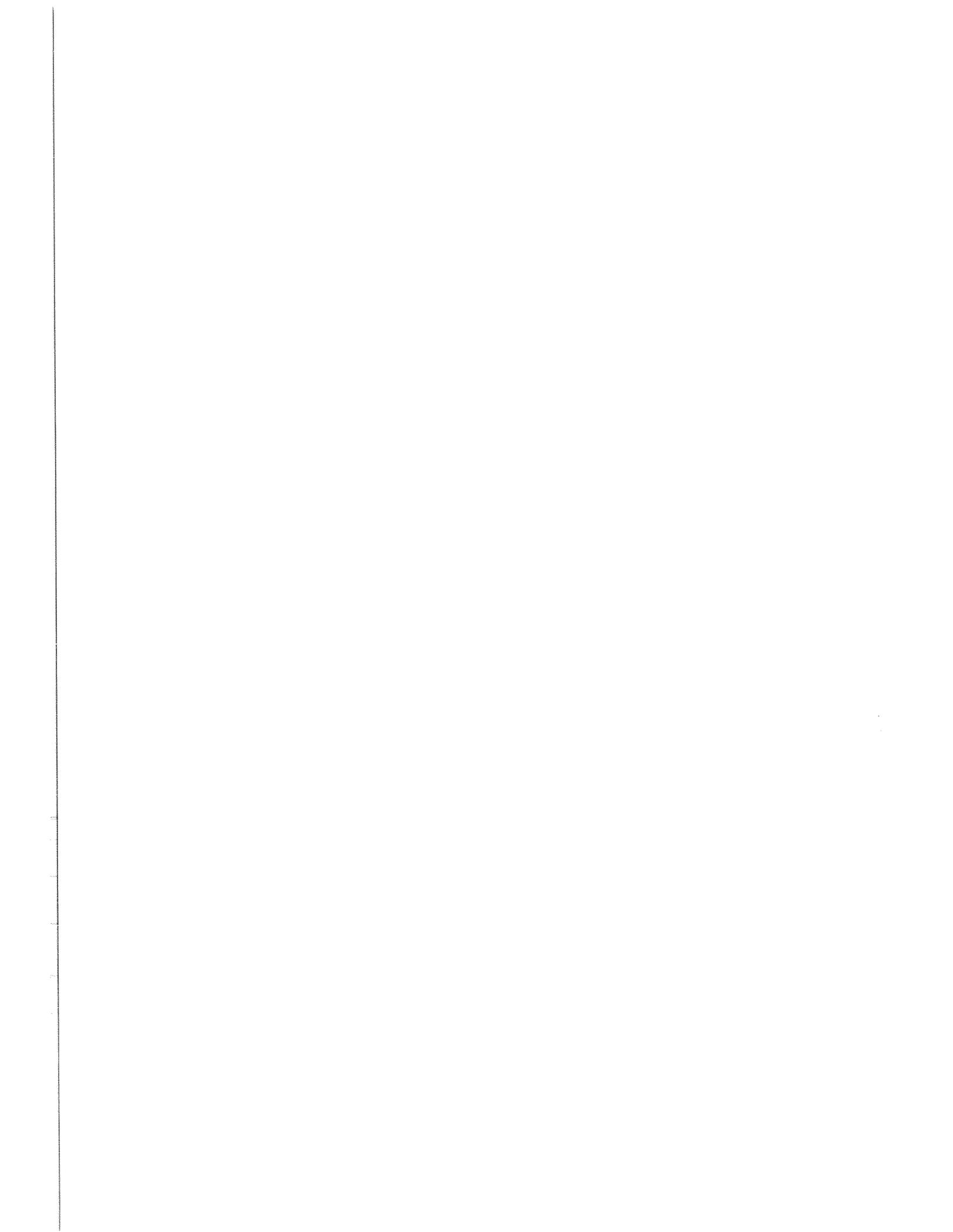
FOREST SERVICE REGION 2 SENSITIVE SPECIES - The FS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed as sensitive by the Regional Forester. The findings of this examination may result in some restrictions to the operator's plan or even disallow use and occupancy that would lead to the listing of a sensitive species under the Endangered Species Act of 1973.

ENDANGERED OR THREATENED SPECIES - The FS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the FS that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resource specialist approved by the FS. An acceptable report must be provided to the FS identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats, and the anticipated effects and impacts to FS Region 2 Sensitive Species that may occur or have habitat in the area.

APPENDIX E

**GROUNDWATER RIGHTS AFFECTED
BY THE NORTH ANTELOPE AND
ROCHELLE MINES**



Appendix E Ground Water Rights Affected by the North Antelope and Rochelle Mines

PERMIT NO.	TSP	RNG	SECTION	OWNER	USE	TOTAL DEPTH (FT)	ZONE OF COMPLETION ¹	DISTANCE FROM PERMIT BOUNDARY (FT)	MAXIMUM ² DRAWDOWN (FT)	WELL YIELD (GPM)
112	41N	70W	16	Dilts	Stock	260	UND	-0-	30	4
2301	41N	70W	16	Dilts	Stock	540	UND	12,000	5	15
2314	41N	70W	9	Dilts	Stock	700	UND	-0-	N	4
12746	42N	70W	25	USDA	Stock	98	OVB	1,000	5	4
23601	41N	71W	29	Isenberger	Stock	250	UNK	28,000	5	7
25607	41N	70W	6	Wilkinson	Stock	805	UND	-0-	N	4
29747	42N	71W	30	USDA	Stock	520	OVB/COAL/UND	27,000	10	3
33290	41N	70W	18	USDA	Stock	644	UND	500	55	10
44331	41N	71W	14	USDA	Stock	605	UND	9,000	25	3
46168	41N	71W	36	Eisenberger & Wyoming	Stock	240	OVB/COAL/UND	14,300	5	5
53195	42N	71W	32	Dilts Brothers	Stock	735	UND	26,000	7	10
63112	41N	71W	24	Bridle Bit Ranch	Stock	442	OVB/UND	6,500	20	6
68138	42N	72W	14	USDA	Stock	960	OVB/COAL/UND	41,000	5	5
8951	42N	70W	15	USDA	Stock	435	UND	10,600	10	14
8975	42N	69W	31	USDA	Stock	107	UND	500	5	4
8985	42N	69W	29	USDA	Stock	60	UND	4,000	5	3
8998	41N	70W	2	USDA	Stock	395	UND	-0-	R	4
29743	42N	69W	31	USDA	Stock	410	UND	-0-	R	10
67821	41N	69W	6	USDA	Stock	8	UND	500	5	1
86094/ 86949	41N	70W	12	PRCC/ USDA	Stock	1,600	TULLOCK	-0-	R	0

¹ UND=Fort Union Formation, up to 500 feet below bottom of coal. Tullock = Fort Union Formation, approximately 800 - 2200 feet below bottom of coal.

² N=Mined through and replaced by North Antelope Coal Company.

³ R=Mined through and replaced by Rochelle Mine.



APPENDIX F

**U.S. FOREST SERVICE, REGION 2
SENSITIVE SPECIES**



U.S. FOREST SERVICE, REGION 2, SENSITIVE SPECIES

FISH

- Flathead chub (*Hybopsis gracilis*). The flathead chub is common in most drainages east of the Continental Divide. Within the boundaries of the Thunder Basin National Grasslands (TBNG), flathead chub have been collected along perennial reaches of Antelope Creek, the Cheyenne River, and the Little Powder River. Typically, flathead chub occur in large silty rivers and seldom in ponds or in lakes.
- Plains topminnow (*Fundulus sciadicus*). In Wyoming, the plains topminnow is found in streams of the North and South Platte drainages, in the Niobrara River, and in headwaters of the Cheyenne River system. It usually inhabits clear, sand- or gravel-bottomed streams with considerable vegetation.

REPTILES AND AMPHIBIANS

- Northern leopard frog (*Rana pipiens*). The northern leopard frog is found throughout Wyoming and is relatively common. The frog is found in or near permanent water with associated vegetation. On occasion, this frog is found near temporary ponds several miles from permanent water. The northern leopard frog rests near pond and lake margins. During the summer months, it may be found foraging actively in protected places among sedges, cattails, and taller grasses.
- Tiger salamander (*Ambystoma tigrinum*). Tiger salamanders are found throughout Wyoming from the lowest elevations to about 10,000 feet. They require a fairly moist environment and seek out places that provide a refuge from the drying influence of sun and wind. Transformed individuals are primarily terrestrial, migrating to ponds and lakes in the spring to breed and remaining there through most of the summer. Larvae may be found in intermittent streams and stockponds, as well as lakes and ponds.
- Milk snake (*Lampropeltis triangulum*). Milk snakes are found under flat stones, decaying logs and stumps, boards, or other debris. They may be found in prairie systems, river bottoms (broadleaf woodlands), rocky hillsides, and coniferous forests.

MAMMALS

- Swift fox (*Yulpes velox*). The swift fox is a yearlong resident in upland grasslands habitats of the TBNG. It prefers grasslands without shrubs and open areas with loose enough soils for burrowing.

BIRDS

- American bittern (*Botaurus lentiginosus*). The American bittern is a summer resident that occasionally may occur on the TBNG. The bird's habitat is marshes, swamps, reedy lakes, slow-moving rivers, moist meadows, and dense riparian thickets.
- Western yellow-billed cuckoo (*Coccyzus americanus*). This bird is found in cottonwood or willow/riparian areas.
- Greater sandhill crane (*Grus canadensis*). The sandhill crane is a summer resident. The nesting habitat consists primarily of marshes, wet-moist meadow grasslands, sedge meadows. An open area with shallow water and, in places, dense vegetation such as willows, sedges, grasses, or rushes is optimal.
- Long-billed curlew (*Numenius americanus*). The long-billed curlew is a summer resident in sagebrush-grasslands. It prefers open areas of shortgrass flats with a few shrubs for nesting.

- Ferruginous hawk (*Buteo regalis*). The ferruginous hawk is a summer resident of the TBNG. Individuals of this species nest in rock outcrops, on the ground, in a bank, or in coniferous trees. On the TBNG, most ferruginous hawks are ground nesters and are found throughout the grasslands.
- White-faced ibis (*Plegadis chihi*). White-faced ibis are uncommon summer residents in wetland areas of the plains. Habitat is almost exclusively ponds, marshes, muddy pools, stream margins, and river banks for breeding, feeding, and resting. Nesting habitat includes bulrushes or cattails, occasionally on the ground on an island.
- Common loon (*Gavia immer*). The common loon is found along rivers or near lakes or ponds with deep water and vegetation up to the water's edge.
- Merlin (*Falco columbarius*). The merlin is a year-round resident which uses a variety of habitats. Merlins prefer open areas to hunt and primarily coniferous forests in which to nest. They also may be found in deciduous woodlands along rivers. In winter, they frequent open parklands and prairies with a few scattered trees.
- Western burrowing owl (*Athene cunicularia*). Burrowing owls are summer residents in the area. They commonly use vacant prairie dog burrows in shortgrass areas and other vacant burrows such as rabbit or badger holes in upland grassland areas with few shrubs.
- Loggerhead shrike (*Lanius ludovicianus*). The loggerhead shrike is a summer resident in upland sagebrush shrubland/grasslands and is also found in pine-juniper woodlands. Shrubs and lookout perches adjacent to feed areas are important to this species.
- Fox sparrow (*Passerella iliaca*). Fox sparrows are year-round residents on the TBNG. They inhabit native riparian shrub with adjacent coniferous forest or woodland-chaparral, as well as burned coniferous and logged/thinned forests, aspen woodland, and willow thickets.
- Black-backed woodpecker (*Picoides arcticus*). This woodpecker is a yearlong resident. Its habitat includes coniferous forests, especially forests that have burned. It nests in cavities in conifers.
- Mountain plover (*Charadrius montanus*). The mountain plover is a summer resident of the shortgrass and mid-grass grasslands. Plovers prefer bare ground or grassy areas without shrubs and vegetative height under 4 inches. Shortgrass habitats modified by prairie dogs, fire, or heavier grazing are frequently selected for nesting. Mountain plovers prefer sites with broad level topography.
- Upland sandpiper (*Bartramia longicauda*). The upland sandpiper is a summer resident on the TBNG. Its habitat is upland grassland with few shrubs, and it nests in a depression on open ground, feeding in open areas where visibility is good.
- Baird's sparrow (*Ammodramus bairdii*). Baird's sparrow is a summer resident on the TBNG. It frequents upland grasslands and is a ground nester in open prairie.
- Black tern (*Chlidonias niger*). The black tern is a summer resident of the TBNG. Black terns inhabit freshwater marshes, wet meadows, and marshy lakes and nest on a floating mat of dead vegetation, often on a muskrat house.
- Lewis' woodpecker (*Melanerpes lewis*). Lewis' woodpecker is a summer resident of the TBNG. Its habitat is cottonwood riparian areas and open ponderosa-pine or pine-juniper coniferous forests. Both dead and live trees are used for nest sites and as foraging perches. Scattered snags or live trees and brushy undergrowth must be available.

INVERTEBRATES

- There are no sensitive invertebrate species or potential habitat known to occur within this portion of the TBNG at this time.

APPENDIX G

**SELECTED PLATES FROM "A STUDY OF TECHNIQUES TO
ASSESS SURFACE AND GROUNDWATER IMPACTS ASSOCIATED
WITH COAL BED METHANE AND SURFACE COAL MINING,
LITTLE THUNDER CREEK DRAINAGE, WYOMING"**

Plate 14
 Modeled Drawdown
 (with Coal Bed Methane)
 In Wyodak Coal
 2005

from

A Study of Techniques to Assess
 Surface and Groundwater Impacts
 Associated with Coal Bed Methane
 & Surface Coal Mining, Little
 Thunder Creek Drainage, Wyoming

A report prepared by the Wyoming Water
 Resources Center, November, 1997

as part of a cooperative agreement involving
 the Wyoming Department of Environmental Quality,
 the Wyoming State Engineer's Office,
 the Wyoming State Geological Survey,
 the Bureau of Land Management,
 the Office of Surface Mining, and
 the University of Wyoming

Legend

Drawdown Contours (feet)

-  5
-  20
-  35
-  50
-  65
-  80
-  115

-  State Highway
-  Model Domain Boundary

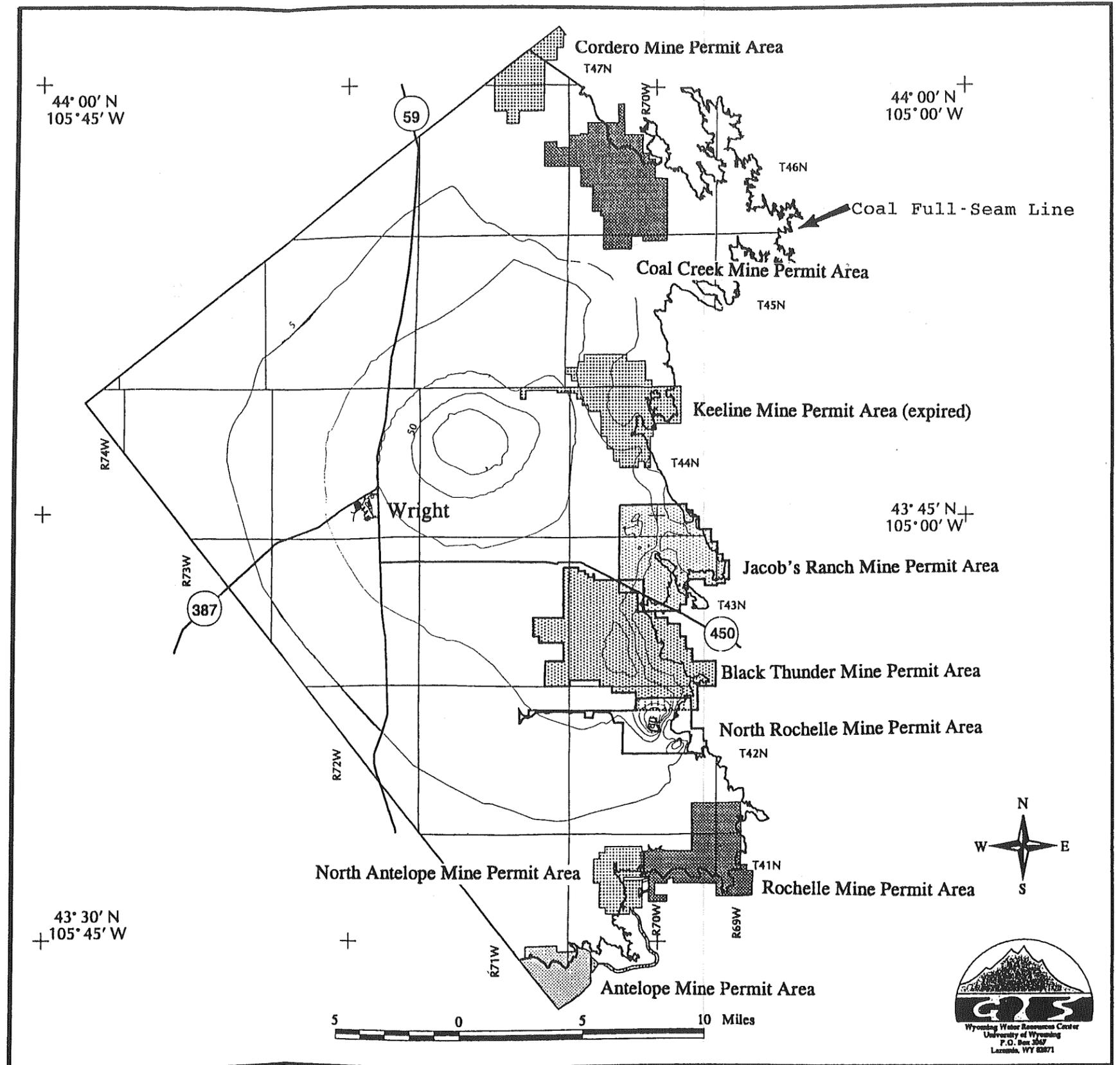


Plate 15
 Modeled Drawdown
 in Wasatch Aquifer
 (with Coal Bed Methane)
 2005

from

A Study of Techniques to Assess
 Surface and Groundwater Impacts
 Associated with Coal Bed Methane
 & Surface Coal Mining, Little
 Thunder Creek Drainage, Wyoming

A report prepared by the Wyoming Water
 Resources Center, November, 1997

as part of a cooperative agreement involving
 the Wyoming Department of Environmental Quality,
 the Wyoming State Engineer's Office,
 the Wyoming State Geological Survey,
 the Bureau of Land Management,
 the Office of Surface Mining, and
 the University of Wyoming

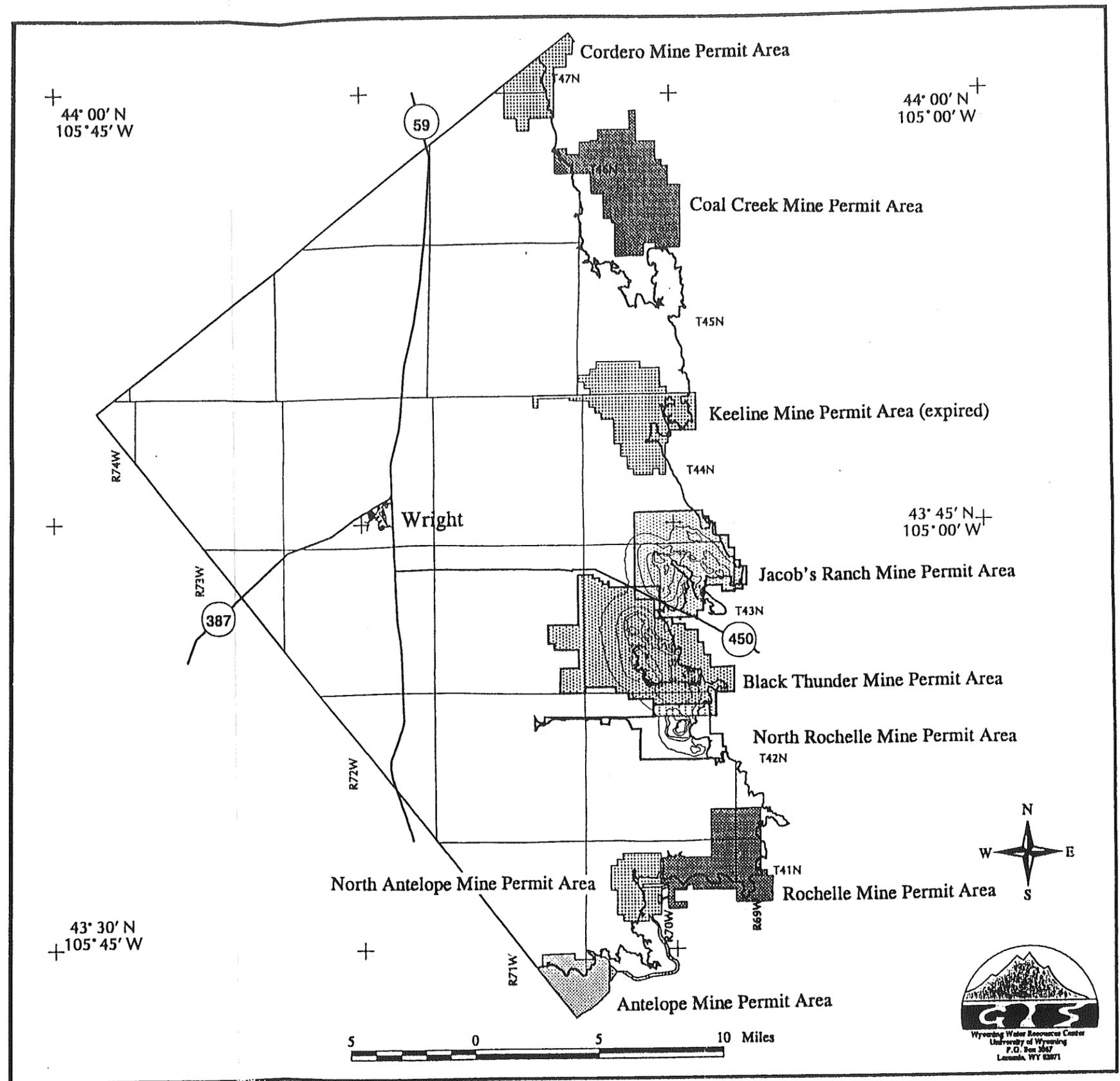
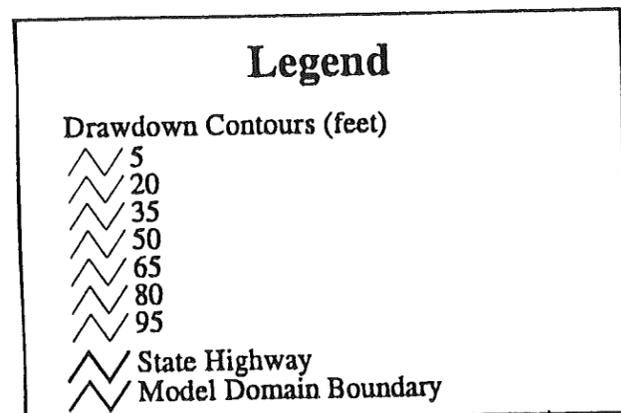


Plate 16
 Modeled Drawdown
 (with Coal Bed Methane)
 in Wyodak Coal
 2021

from

A Study of Techniques to Assess
 Surface and Groundwater Impacts
 Associated with Coal Bed Methane
 & Surface Coal Mining, Little
 Thunder Creek Drainage, Wyoming

A report prepared by the Wyoming Water
 Resources Center, November, 1997
 as part of a cooperative agreement involving
 the Wyoming Department of Environmental Quality,
 the Wyoming State Engineer's Office,
 the Wyoming State Geological Survey,
 the Bureau of Land Management,
 the Office of Surface Mining, and
 the University of Wyoming

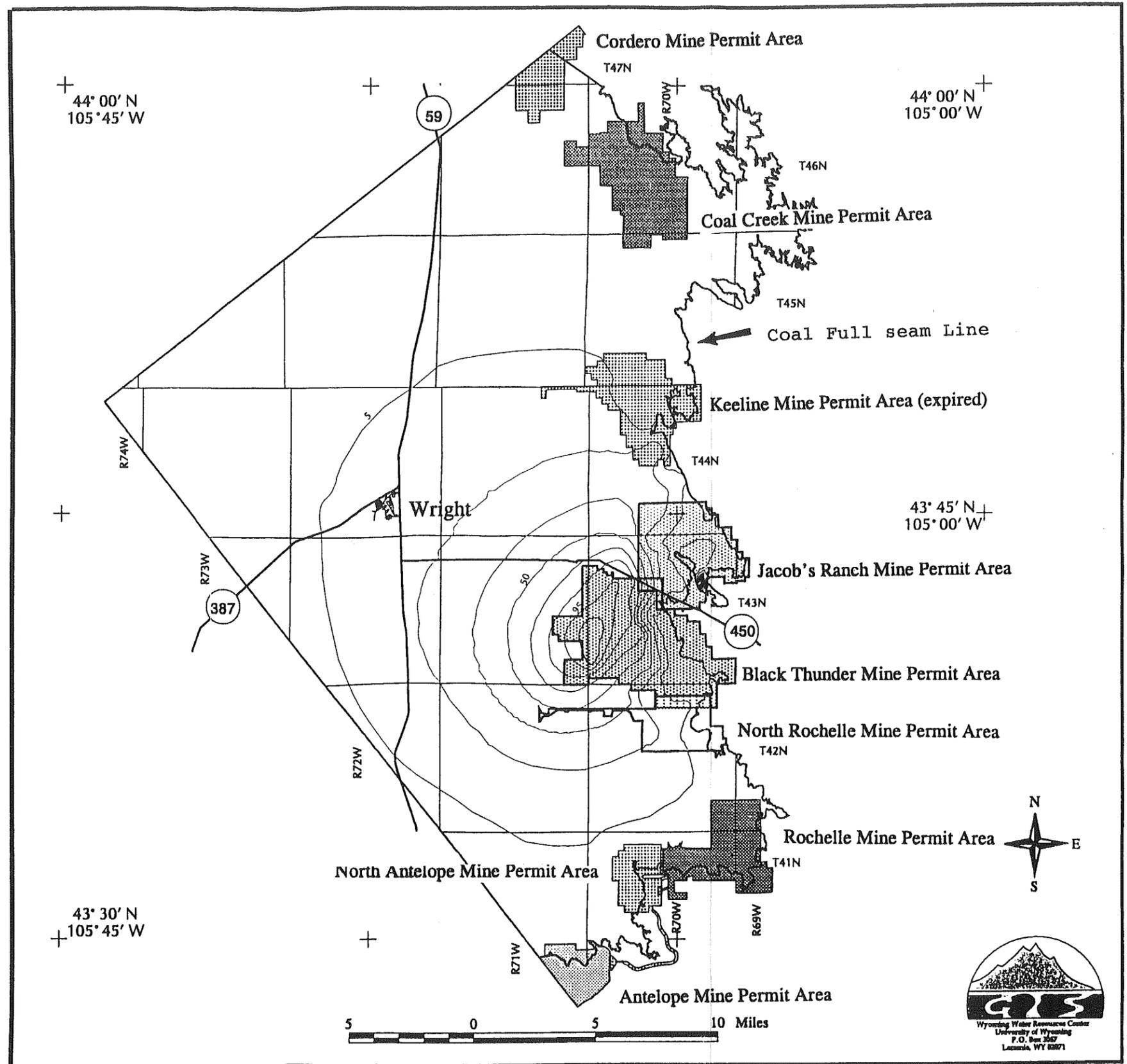
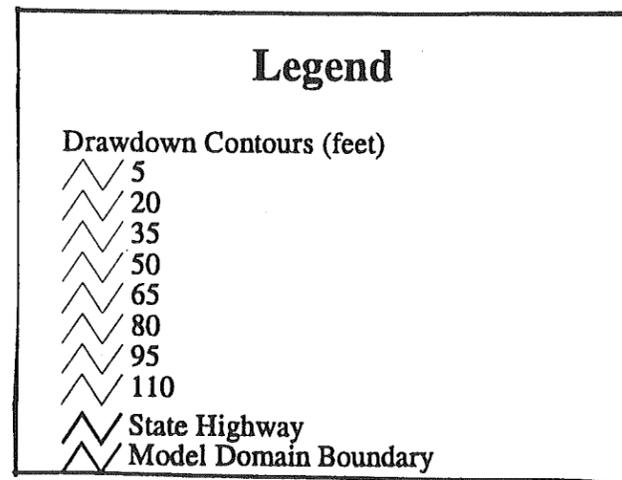


Plate 17
 Modeled Drawdown
 in Wasatch Aquifer
 (with Coal Bed Methane)
 2021

from

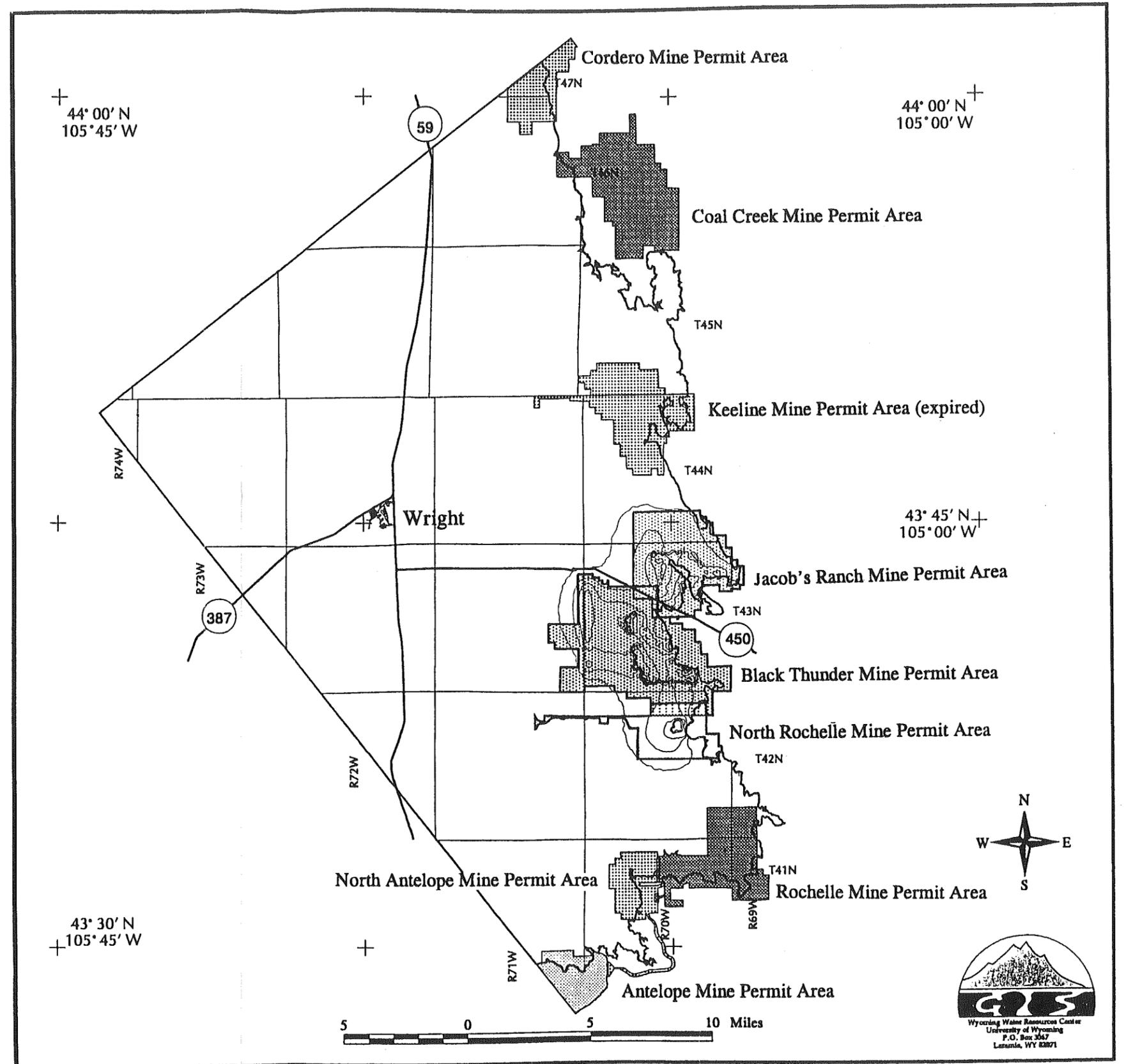
A Study of Techniques to Assess
 Surface and Groundwater Impacts
 Associated with Coal Bed Methane
 & Surface Coal Mining, Little
 Thunder Creek Drainage, Wyoming

A report prepared by the Wyoming Water
 Resources Center, November, 1997
 as part of a cooperative agreement involving
 the Wyoming Department of Environmental Quality,
 the Wyoming State Engineer's Office,
 the Wyoming State Geological Survey,
 the Bureau of Land Management,
 the Office of Surface Mining, and
 the University of Wyoming

Legend

Drawdown Contours (feet)

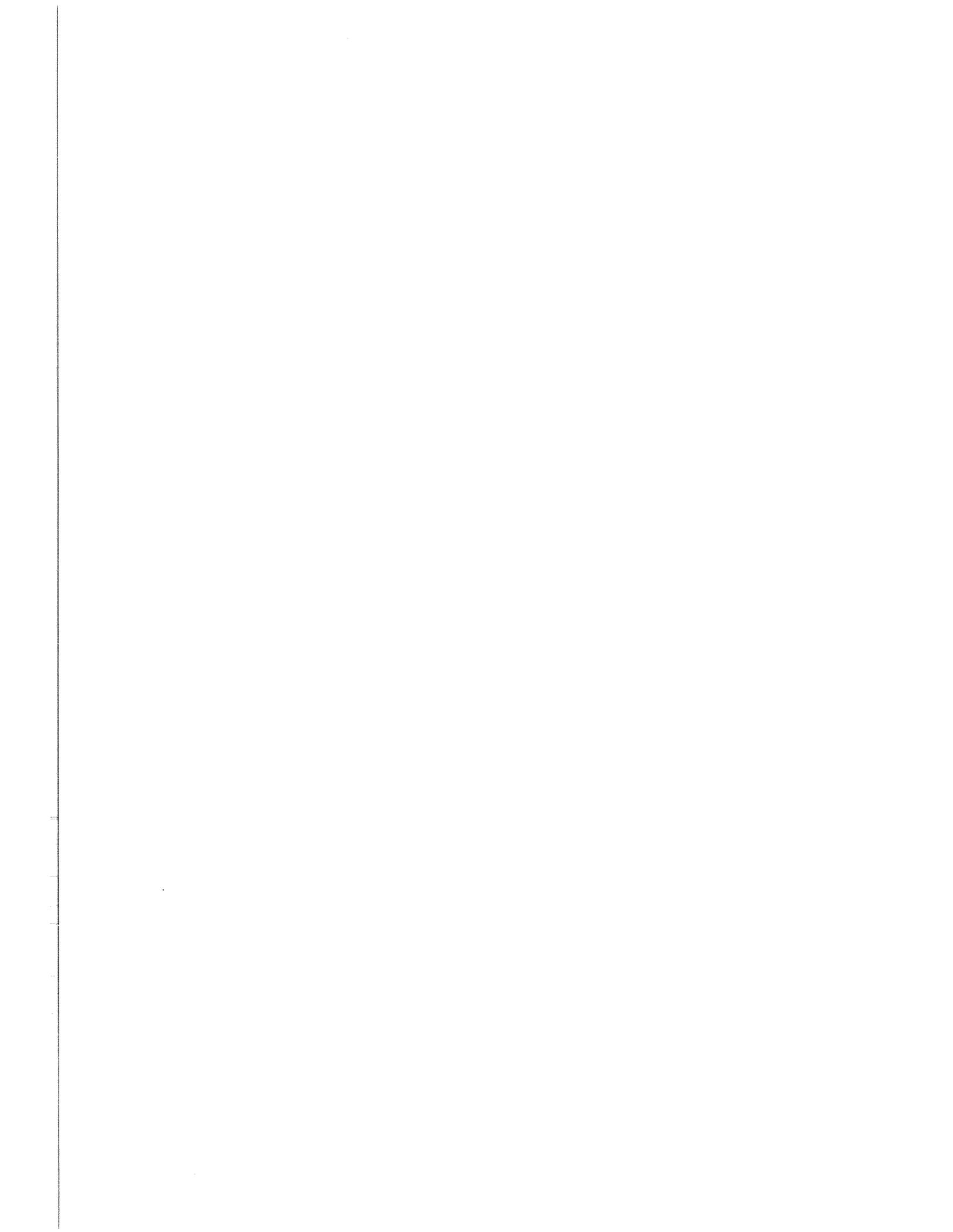
-  5
-  20
-  35
-  50
-  65
-  80
-  95
-  State Highway
-  Model Domain Boundary





APPENDIX H

COMMENT LETTERS AND RESPONSES





United States Department of the Interior

LAND MANAGEMENT
CASPER DISTRICT OFFICE



BUREAU OF RECLAMATION 97 SEP 23 PM 1:39
Great Plains Region
Wyoming Area Office
P. O. Box 1630
Mills, Wyoming 82644-1630

IN REPLY REFER TO:

WY-450
ENV-6.00

SEP 22 1997

MEMORANDUM

To: Bureau of Land Management, Casper District Office, 1701 East E Street, Casper WY 82601
Attention: Ms. Nancy Doelger

From: John H. Lawson
Area Manager, Mills WY

Subject: Draft Environmental Impact Statement (EIS) of the Powder River Coal Lease Application and Thundercloud Coal Lease Application

Thank you for providing the Bureau of Reclamation (Reclamation) Wyoming Area Office (WYAO) with the opportunity to comment on the above-mentioned subject. Our Office has reviewed the draft EIS, and it was noticed that the Lease-By-Application tracts are located within the Cheyenne River basin. Reclamation's Angostura Reservoir, under administration by Reclamation's Dakotas Area Office (DKAO), is situated on the Cheyenne River in South Dakota. As this is the case, the WYAO and DKAO must be notified of any change in water quality and quantity at the Wyoming-South Dakota state line. In addition, any change in water quality and quantity of water in the Cheyenne River must be addressed in the EIS.

If we can be of further assistance, please let us know.

cc: U.S. Bureau of Reclamation
Dakotas Area Office
Dennis Breitzman, Area Manager
P.O. Box 1017
Bismarck ND 58502



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

BUREAU OF LAND MANAGEMENT
CASPER DISTRICT OFFICE

October 8, 1997

97 OCT 14 PM 1:35

Wyoming Regulatory Office
2232 Dell Range Blvd., Suite 210
Cheyenne, Wyoming 82009

Ms. Nancy Doelger
Bureau of Land Management
Casper District Office
1701 East "E" Street
Casper, Wyoming 82601

Dear Ms. Doelger:

This is in response to your agency's request for comments on the Draft Environmental Impact Statement for the Powder River Coal Lease Application and Thundercloud Coal Lease Application received August 20, 1997.

A review of the provided information indicates that the document accurately reflects the need for authorization in accordance with Section 404 of the Clean Water Act. The Corps of Engineers regulates the discharge of dredged and fill material into wetlands and other waters of the United States primarily under the authority of the Clean Water Act.

As the EIS states, the Corps requires that a detailed delineation and identification of all waters of the U.S. (including wetlands) contained in the mine permit area needs to be accomplished prior to receiving authorization for surface coal mining activities. Kerr-McGee Coal Corporation submitted a jurisdictional delineation of wetlands and other waters of the U.S. on the Thundercloud Tract on July 10, 1997. A September 8 & 9, 1997 site visit resulted in minor revisions to that delineation. Based upon the information submitted and the referenced site visit, it has been determined that the wetland and waters of the U.S. delineation lines shown on the plan entitled, "Wetlands and Other Waters of the United States Inventory," consisting of 1 sheet, dated 9-29-97 with no revisions, and as clarified in Addendum D10 - Wetlands and Other Waters of the U.S. Inventory, Kerr-McGee Coal Corporation, Thundercloud Tract, dated September 1996, and revised September 1997, are an accurate depiction of wetlands and waters of the United States contained in the Thundercloud Tract. The delineation identifies a total of 104.39 acres of waters of the U.S. of which 56.65 acres are wetlands. There is an additional 0.97 acres of non-jurisdictional wetlands also contained in the tract. Totals in section 3.8 of the EIS should be modified to reflect these numbers.

No request has been made for the proposed Powder River Coal Application tract but one is anticipated.

Section 4.5.7 on page 4-44 states that no cumulative are expected to occur. The document should justify that conclusion. The Jacobs Ranch Mine has been authorized to impact over 90 acres of waters of the U.S. (80 acres which are wetlands). The Rochelle and North Antelope Mines have been authorized to impact 21 and 5 acres, respectively. Although it is anticipated that all wetlands and other waters will eventually be re-established through mitigation techniques, there is a period of time where wetland functions are lost. Additionally, reclamation of the mine site may not replace exact functions and landscape features which should be a consideration in cumulative effects evaluations.

Thank you for the opportunity to comment on the EIS. If you have any questions concerning this matter, please contact Chandler Peter at (307) 772-2300. Please refer to File No. 199740368 in any future correspondence.

Sincerely,


for Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

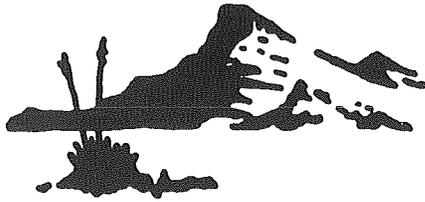
Copies furnished:

Darryl Maunder
Kerr-McGee Coal Corporation
Caller Box 3013
Gillette, Wyoming 82717

Jim Orpet
Intermountain Resources
P.O. Box 1589
Laramie, Wyoming 82073

POWDER RIVER BASIN RESOURCE COUNCIL

23 North Scott • Sheridan, WY 82801 • (307) 672-5809



October 27, 1997

FAX TRANSMISSION

97 OCT 28 PM 12:50

POWDER RIVER BASIN RESOURCE COUNCIL

Ms. Nancy Doelger
Bureau of Land Management
Casper District Office
1701 East E Street
Casper, Wyoming 82601

RE: Comments on the EIS for the Powder River Coal Lease Application and the Thundercloud Coal Lease Application

Dear Ms. Doelger,

The Powder River Basin Resource Council is a membership based organization dedicated to the conservation of our unique land, minerals, water and clean air consistent with the reasonable use of these resources to sustain the livelihood of present and future generations. We are also dedicated to the preservation and enrichment of our agricultural heritage and rural lifestyle. The organization also has a longstanding concern and involvement in coal leasing and development.

The Proposed Action:

1 The Environmental Impact Statement (EIS) notes that under the proposed action the Powder River Coal Company would acquire 4,023.46 acres and an estimated 489 million tons of federal coal. The Kerr McGee Coal Company would acquire 3,395.91 acres and an estimated 427 million tons. These seem to be unusually large lease by application tracts. Has the BLM issued tracts to one company this size before? If so, when?

2 In the case of the North Antelope and Rochelle mines this tract will secure an additional 7 to 8 year supply of coal at their projected levels of production. In the case of Kerr McGee the proposed lease would ensure 12 to 13 years of coal at their projected levels of production. How many years of coal reserves do they currently have? When was the last coal lease sold to these mines? How long were those reserves projected to last? Why are they coming back so soon to lease again? Why does the BLM need to supply this large coal reserve? Why not make it smaller and lease later when the price of coal could be higher?

Environmental Consequences - Groundwater:

3 We believe that the EIS is deficient in the analysis of the impacts to groundwater. On page 4-36 the document refers to a groundwater drawdown study and model that was to be conducted as part of a cooperative agreement signed in 1993. The results of this study are not included and the document states they are being edited. Moreover, that study did not take into account mining all the existing leases or proposed leases nor is that analyzed in this EIS. Rather, the BLM attempts to abdicate this responsibility to the state in the permitting process. In the analysis that was done by the coal companies please explain how the data was extrapolated and what independent analysis was done to verify the data. Also, no drawdowns were modeled for the Wasatch aquifer. Why not?

4 What are the impacts on the lower Fort Union aquifer. This aquifer becomes more critical and used as the coal aquifer is depleted yet, the EIS did not include any modeling or projected impacts on the Fort Union aquifer.

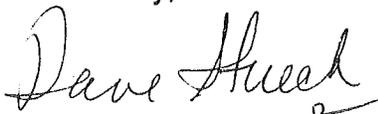
5 We are particularly concerned about the overlapping impacts of coal mining and coalbed methane development. We understand that additional coalbed methane development is planned in this area.

6 We are concerned about the quality of groundwater after mining. On page 4.44, the EIS discusses several analyses of wells completed in spoil aquifers that were conducted by the mines. Some of these analyses are outdated and any recent ones had Total Dissolved Solid (TDS) levels ranging from 400 to 25,000 mg/L. How many backfill wells were tested in the 1996 Gillette Area Groundwater Monitoring Organization (GAGMO) a report? Has there been any independent testing? What water replacement requirements exist when the water is unfit for domestic or livestock purposes? Why didn't the EIS do some independent analysis of cumulative groundwater impacts?

We have requested an on-the-ground tour of the proposed lease areas and may have additional comments to submit regarding habitat impacts, cultural resources or other issues.

Thank you for this opportunity to comment.

Sincerely,



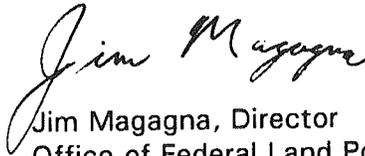
Dave Stueck
PRBRC Member

Nancy Deolger
Powder River/Thundercloud DEIS
October 28, 1997
Page Two

Department, and the State Geological Survey for your review. I trust you will give them careful consideration.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in cursive script that reads "Jim Magagna".

Jim Magagna, Director
Office of Federal Land Policy

JM:jh
Enclosures

WYOMING
GAME AND FISH DEPARTMENT



6

October 7, 1997

WER 8754
Bureau of Land Management
Casper District Office
Draft Environmental Impact Statement
Powder River and Thundercloud Coal Lease
Applications
SIN: 97-140
Campbell County

WYOMING STATE CLEARINGHOUSE
OFFICE OF FEDERAL LAND POLICY
ATTN: JULIE HAMILTON
HERSCHLER BUILDING, 3W
CHEYENNE, WY 82002

Dear Ms. Hamilton:

The staff of the Wyoming Game and Fish Department has reviewed the Draft Environmental Impact Statement for the Powder River and Thundercloud Coal Lease Applications. We offer the following comments.

1. Public Land Access, Powder River Lease. If the proposed lease is issued, there will be a loss of accessible public land along the Piney Canyon Road. This area receives use by the public for hunting and other wildlife-based recreation. Section 4.3.11 states Powder River Coal Company has agreed to help the U.S. Forest Service finance land exchanges within the area to acquire more accessible public land. As more information becomes available, the amount and location of lands to be acquired should be identified. If there is still a net loss of accessible public land or wildlife-based recreation opportunities, the Bureau of Land Management should assure these losses are mitigated.
2. Cumulative Impacts. From a wildlife habitat perspective, we believe the attempt to minimize the potential cumulative impacts (Section 4.5, third paragraph, p 4-25) is misleading. We agree the numbers of acres and type of vegetation disturbed would vary from year to year. However, until the habitat is restored to pre-mine condition, the habitat function may not be restored. This is especially true for areas of medium to high shrub density. Therefore, the impact from mining is cumulative until the habitat function is restored.



WYOMING STATE GEOLOGICAL SURVEY

P.O. BOX 3008 • LARAMIE, WYOMING 82071-3008
 (307) 766-2286 • FAX 307-766-2605 • E-MAIL wsgs@wsgs.uwyo.edu

STATE GEOLOGIST - Gary B. Glass

GEOLOGICAL SURVEY BOARD

Ex Officio
 Governor Jim Geringer
 Douglas R. Dow Philip L. Dubois
 Gary B. Glass

Appointed
 Nancy M. Deelger Ronald A. Baugh
 Victor R. Haslforth Charles M. Love
 Stephen L. Payne

SECTION HEADS

Coal
 Robert M. Lyman

Geologic Hazards
 James C. Case

Geologic Mapping
 Alan J. Ver Ploeg

Industrial Minerals/Ironium
 Roy E. Harris

Metals/Precious Stones
 W. Dan Hausel

Oil and Gas
 Rodney H. De Brulin

Publications
 Richard W. Jones

October 13, 1997

MEMORANDUM

TO: Julie Hamilton, Wyoming State Clearinghouse

FROM: Gary B. Glass, P.G., State Geologist

SUBJECT: Draft Environmental Impact Statement for the
 Powder River Coal Lease Application (WYW136142) and
 Thundercloud Coal Lease Application (WYW136458)
 (State Identifier # 97-140)

We have the following comments regarding this document:

First, we support both of these proposed coal lease sales. There is a growing need for the low-sulfur, compliant coal in these leases. This need and the importance of the coal mining industry to Wyoming are addressed in the document. So is the need to lease these tracts as expeditiously as possible.

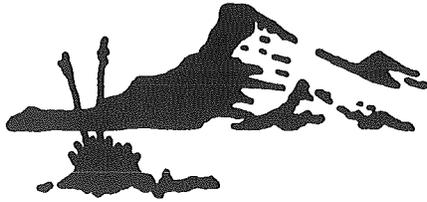
- 1 There was mention of chemical changes to the soil as a result of mining. Do the changes pose any documented or potential problems that need discussion?

There is some potential for finding significant mammalian fossils in the Wasatch and Fort Union outcrops in the lease areas. The document addresses this potential and notes that paleontologic surveys have been completed on the Powder River tract. Are there plans for a similar study of the Thundercloud tract?

On page 3-8, the average analysis of the Wyodak coal reportedly taken from Glass and Jones (1992) is incorrect. The volatile matter should be 30.7%, and the moisture content 29.8%. The analysis was also on an as-received basis, therefore, the moisture content is not an "equilibrium moisture".

In regard to the section on bentonite (p. 3-10), this clay is not used in the manufacture of concrete. Bentonite is also not found in the Tertiary units that crop out on or near the lease tracts.

Because Wyoming has passed legislation requiring the licensure of geologists practicing before the public, it would be appropriate to identify those licensed individuals listed in Table 5-2 on pages 5-3 and 5 4.



POWDER RIVER BASIN RESOURCE COUNCIL

9

23 North Scott • Sheridan, WY 82801 • (307) 672-5809
P.O. Box 1178 • Douglas, WY 82633 • (307) 358-5002

December 1, 1997

Ms. Nancy Doelger
Bureau of Land Management
Casper District Office
1701 East E Street
Casper, Wyoming 82601

97 DEC -2 PM 1:23

BUREAU OF LAND MANAGEMENT
CASPER DISTRICT OFFICE

RE: Additional Comments regarding the EIS and the proposed coal leases for Powder River Coal Company and the Kerr McGee Coal Company

Dear Ms. Doelger:

The Powder River Basin Resource Council has the following additional questions and comments concerning the above referenced leases since our tour of the proposed lease areas on November 6th.

1 First, it became clear from the tour that there is a real question about the need for leasing, particularly in the case of the Thundercloud tract. According to Kerr McGee's representative Mr. Turpin, Kerr McGee has not mined the 132 million tons of coal they leased in 1992. This being the case we want to see more justification for the need to lease this tract at this time? It seems the answer lies in the fact that the opportunity for competitive bidding is much less, according to Mr. Gaskill of the BLM, because ARCO is getting out of the coal business and the adjacent Thunderbasin mine is up for sale. Therefore the chance of any competitive bidding is not very likely. It appears that the decision to place the Thundercloud tract up for lease is opportunistic and not a true or urgent need to maintain current production levels.

2 Please include details and facts that justify the need for these leases. Both companies say they need them to meet contracts yet, we see no proof of that. Please include maps in the final EIS showing previous lease tracts and current mined out or mining areas. These leases appear to be speculative in nature and with the price of coal so low why is the BLM leasing at the time? Please discuss how the BLM values or prices the coal? Is the coal priced on the basis of overburden? How has the BLM considered or analyzed delaying leasing until the price of coal improves or competition improves? Please include some discussion of the important issue of getting the best value for this public resource.



recycled paper

3

There also needs to be a more detailed discussion in the EIS on the public lands that will be taken out of public use that are currently used for recreation and hunting. How many public surface lands are involved and what sort of mitigation is proposed?

4

Please included a better description of the cultural resources in these lease areas and mitigation plans for the sites.

Thank you.

Sincerely,

A handwritten signature in cursive script that reads "Dave Stueck". The signature is written in black ink and includes a small flourish at the end.

Dave Stueck
PRBRC Member

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EQ-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommend for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Letter 1: Bureau of Reclamation, Great Plains Region, Wyoming Area Office, Casper, Wyoming

As explained in the EIS, the Powder River and Thundercloud LBA tracts are maintenance tracts for the existing North Antelope, Rochelle, and Jacobs Ranch Mines. Therefore, if they are leased, there would be a continuation of ongoing mining activities, not new mining activities. Please refer to Sections 4.1.5 and 4.5.5 of the EIS for a discussion of potential impacts to surface water quality and quantity. State and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards. The current approved mining and reclamation plans for the North Antelope, Rochelle and Jacobs Ranch Mines include sediment ponds and other sediment control devices designed to control surface water quality impacts on the existing leases. If the two LBA tracts are leased and before they can be mined, the existing mining and reclamation plans must be amended to include the LBA tracts and the amended plans must be approved. The amended mining and reclamation plans would include sediment control for the additional area of disturbance at each mine.

The Dakotas Area Office has been added to the mailing list for the FEIS.

Letter 2: Department of the Army, Corps of Engineers, Omaha District, Omaha, Nebraska

The wetland delineation discussion of the Thundercloud tract in Section 3.8 and the wetland cumulative impact discussion in Section 4.5.7 have been updated or revised in accordance with the information and comments provided in your comment letter.

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Letter 3: Powder River Basin Resource Council, Sheridan, Wyoming,
October 27, 1997

(Note: Responses are numbered in reference to numbered paragraphs in the comment letter.)

Paragraph 1:

As indicated in Table 1-1 of the draft and final EIS documents, the two largest federal coal leases issued under the lease by application process were: the West Black Thunder lease, issued to Thunder Basin Coal Company in 1992, which included approximately 3,500 acres and 429 million tons of minable coal; and the North Antelope/Rochelle LBA, issued to Powder River Coal Company in 1992, which included approximately 3,000 acres and 403.4 million tons of coal. Several large leases were issued after the 1982 lease sale, including the original Rocky Butte lease (approximately 4,900 acres, and a lease to the Buckskin Mine (approximately 3,275 acres). Prior to that, leases issued in the late 1960s and early 1970s include: a lease now owned by the Caballo Rojo Mine (5,251 acres, 1/20/71), a lease now owned by the Black Thunder Mine (5,844 acres, 12/1/66), a lease now owned by the Caballo Mine (5,250 acres, 12/1/67), and a lease now owned by the Cordero Mine (6,500 acres, 3/1/71).

Paragraph 2:

Question 1: *How many years of coal reserves do they currently have?*

As of January 1, 1997, there were approximately 269 million tons of remaining recoverable reserves at the Jacobs Ranch Mine. This would be mined out in approximately 10 years at the No Action Alternative production rate of 27 million tons per year. (See draft and final EIS documents, page 1-9.)

At the North Antelope and Rochelle Mines there are approximately 665 million tons of remaining permitted recoverable coal. If this were mined at the currently permitted rate of 65 million tons per year, it would take 10 years. However, Powder River Coal Company (the applicant) has evaluated the remaining reserves in their existing leases, and determined that, due to quality problems, not all of the coal in the existing leases is currently marketable unless it can be mixed with higher quality reserves like those in the Powder River LBA tract. As a result, they anticipate that their marketable reserves would be mined out

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

in 2002 without the additional higher quality coal in the LBA tract. Powder River Coal Company applied for the Powder River LBA tract in order to maintain a blend of coal quality needed to meet customer specifications at the currently permitted production rates and to maximize the use of their already leased, lower quality reserves. (See the FEIS, page 1-9, for additional discussion of this topic.)

Question 2: *When was the last coal lease sold to these mines?*

The Jacobs Ranch Mine was most recently issued a lease effective October 1, 1992. The North Antelope and Rochelle Mines were also most recently issued a lease effective October 1, 1992. (see draft and final EIS documents, Table 1-1 and page 1-5.)

Question 3: *How long were those reserves projected to last?*

According to the "*Final Environmental Assessment for the North Antelope and Rochelle Coal Lease Applications for Powder River Coal Company*", May 1992, page 10, it was anticipated that the lease issued in 1992 would extend the life of the North Antelope Mine and Rochelle Mines by 10 years and 8 years respectively at the 1992 estimated production rates of 12 million tons and 18 million tons per year, respectively. Using the currently permitted production rates of 65 million tons per year, the coal leased in 1992 represents 6.2 years of production.

According to the "*Jacobs Ranch Federal coal Lease Application Environmental Assessment*", June 1991, page 11, it was anticipated that the lease issued in 1992 would extend the life of the Jacobs Ranch Mine by approximately 8 years at the 1992 estimate production rate of 16.8 million tons per year. Using the currently permitted production rates of 27 million tons per year, the coal leased in 1992 represents 5.4 years of production.

Question 4: *Why are they coming back so soon to lease again?*

The leasing and permitting process is lengthy, so the companies must plan ahead in order to acquire and market the coal. The Powder River and Thundercloud tracts were applied for in 1995, decisions on leasing these tracts are scheduled for 1998, and if the two tracts are leased, the permitting process will probably take a year or two to complete, which will be 1999 or 2000. That will be 7 or 8 years after the two previous LBAs

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

were issued to the current applicants, and the reserves in the 1992 leases were predicted to last for 8 to 10 years as indicated in the response to question 3 above. Also, as indicated above, the production rates at these mines have increased, so the existing reserves will, in fact, be mined more quickly than anticipated in 1992.

Questions 5 & 6: Why does BLM need to supply this large coal reserve? Why not make it smaller and lease later when the price of coal could be higher?

BLM evaluates leasing maintenance LBA tracts in response to applications filed by companies with an interest in acquiring them. The mines apply for coal based on their need for additional coal to extend the lives of their existing mines.

At current rates of production at the North Antelope, Rochelle and Jacobs Ranch Mines, the coal in the Powder River and Thundercloud LBA tracts is projected to be mined in approximately 8 and 11 years, respectively. As indicated in the response to Question 4, approximately 5 years will probably elapse between the time the Powder River and Thundercloud tracts were applied for (1995), and the time they would be permitted to mine if they are leased (estimated 2000). Reducing the size of the tracts would reduce the time it takes to mine them, but it would not significantly change the time or expense (for both the regulatory agencies and the mining operators) that it takes to lease and permit them.

Delaying the lease sales until the price of coal is higher is considered in the draft and final EIS documents as Alternative 4 (see Page 2-11 of the draft and final EIS documents). As indicated in the EIS, an increase in coal prices in the Powder River Basin could increase the fair market value of the coal when it is leased, which would potentially increase the bonus bid received for the coal at the time it is leased. There is no way to predict when or if coal prices are going to increase, however, if they do, the royalty that the government receives for the coal at the time it is sold will increase. Royalty payments are the largest source of income to federal and state governments from the leasing and mining of federal coal.

Paragraph 3:

The results of the groundwater drawdown study discussed in

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

the DEIS on page 4-36 are included in the FEIS, and that analysis is independent of the analyses done by the coal companies. Figure 4-3 of the draft and final EIS documents includes a prediction of the cumulative worst case drawdown for the existing leases owned by the Jacobs Ranch, Black Thunder, North Rochelle, Rochelle and North Antelope Mines, and the Thundercloud and Powder River Tracts.

For the Powder River tract, the extent of the 5-foot drawdown was predicted by modeling. For Thundercloud, the extent of the 5-foot drawdown contour presented in the approved Jacobs Ranch Mine mining and reclamation permit was extended by the same distance that mining of the Thundercloud LBA tract of the Thundercloud LBA tract would extend the coal pit. This extrapolation is consistent with the previous modeling results, which are evaluated by comparing them with actual drawdowns measured in monitoring wells. Evaluation of past predictions prepared during the leasing stage with predictions prepared during the permitting stage indicates that the more detailed analysis that is done as part of the permitting process may result in minor changes to the predicted extent of the 5-foot drawdown, but not the general type and magnitude of groundwater impacts that can be expected as a result of maintenance leasing by existing mining operations.

As explained in the draft (page 3-20 and 4-40) and final (pages 3-19, 3-20, and 4-42) EIS documents, the sandstone and coal aquifer units within the Wasatch Formation are not continuous so the Wasatch is not considered a regional aquifer, and the Wasatch Formation within the Thundercloud and Powder River LBA tracts includes relatively little saturated sand. This is why the Wasatch Drawdown is not modeled, as indicated on pages 4-7 and 4-37 of the DEIS and pages 4-7 and 4-38 of the FEIS.

Paragraph 4:

The cumulative impacts to the sub-coal Fort Union Formation are discussed on pages 4-42 and 4-43 of the DEIS, and 4-44 and 4-45 of the FEIS. No new sub-coal Fort Union Formation wells are planned under either of the action alternatives, however, the lives of existing sub-coal water supply wells would be extended and therefore additional water would be withdrawn from the sub-coal Fort Union if the LBA tracts are mined as extensions of the existing operations. In the area analyzed by the DEIS, the only

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

permitted wells greater than 1000 feet deep completed in the Fort Union Formation that do not belong to mining companies are wells that belong to the City of Wright. Extending the time that water is withdrawn from the sub-coal Fort Union by the mines as a result of mining the LBA tracts is not expected to impact these wells.

Paragraph 5:

Currently, no coal bed methane production is being reported in the area of either LBA tract. A search of the December, 1997 PI/Dwights Location Drilling & Completion Database identified seven wells with a total depth of less than 1000 feet in Townships 41-43 North, Ranges 70 and 71 west. One of these wells was completed in the Fort Union in 1983 and ceased production in 1986; four of the wells were drilled in 1994 by a company named Energx, but have never reported production; and the remaining two wells were stratigraphic tests drilled by Western Gas Resources in 1995 and 1996. No new locations have been reported in this area. This information based on data submitted to the Wyoming Oil and Gas Conservation Commission, which must approve all oil and gas well drilling in the state.

As indicated in the cumulative impact analysis in the DEIS and the FEIS, the area of coal bed methane development is expected to continue southward in the direction of the southern six coal mines. If coal bed methane resources are developed adjacent to these mines, the resulting groundwater drawdown in the Wyodak coal seam would be expected to overlap with the drawdown caused by mining the Wyodak coal seam.

Paragraph 6:

Question 1: *How many backfill wells were tested in the 1996 GAGMO report?*

Fifty-two backfill well quality tests were reported in the in the 1996 GAGMO report (which summarizes 1995 monitoring data).

Question 2: *Has there been any independent testing?*

The data presented in the Gillette Area Groundwater Monitoring Organization (GAGMO) reports are collected by the mining companies. Several of the mines use independent contractors to sample wells and independent labs to analyze water quality.

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Question 3: What water replacement requirements exist when water is unfit for domestic or livestock purposes?

The Wyoming Environmental Quality Act W.S. 35-11-415(b) (xii) states:

"For surface coal mining operations, replace in accordance with state law the water supply of an owner of interest in real property who obtains all of part of his supply of water for domestic, agricultural, industrial, or other legitimate use from an underground or surface source where the supply has been affected by contamination, diminution, or interruption proximately resulting from the surface coal mine operation."

Question 4: Why didn't the EIS do some independent analysis of cumulative groundwater impacts?

The BLM participated in the cooperative agreement to develop an independent model evaluating impacts to groundwater quantity, which was used in the previously mentioned pilot study involving the Jacobs Ranch, Black Thunder, and North Rochelle Mines, as discussed in the DEIS and FEIS documents. Four plates summarizing the results of this pilot study are included in the FEIS. This model was also used to evaluate coal bed methane development in the Lighthouse coal bed methane project area. The modeling done by the mining companies is technically evaluated by the Wyoming Department of Environmental Quality, Land Quality Division, and the modeling results are compared with monitoring data collected by the mines. The monitoring wells are a requirement of the mining and reclamation permits

U.S. Geological Survey Water Resources Investigations Report 88-4046, also known as the US Geological Survey CHIA, describes independent geochemical studies relating to post-mining groundwater quality. A comparison of the results of these studies with the water quality analyses that have been reported for the backfill monitoring wells in GAGMO do not suggest that the monitoring being done by the companies is unreliable.

Letter 4: U.S. Forest Service, Douglas, Wyoming

As indicated in the FEIS, the cultural survey for the Thundercloud LBA Tract has been completed, and has been sent to SHPO for review.

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Letter 5: State of Wyoming, Office of the Governor, Cheyenne, Wyoming

Comment 1.

Wyoming State Law requires that water wells damaged as a result of surface coal mine operations be replaced. The Wyoming Environmental Quality Act W.S. 35-11-415(b)(xii) states: "For surface coal mining operations, replace in accordance with state law the water supply of an owner of interest in real property who obtains all of part of his supply of water for domestic, agricultural, industrial, or other legitimate use from an underground or surface source where the supply has been affected by contamination, diminution, or interruption proximately resulting from the surface coal mine operation." This requirement is reinforced in the mining and reclamation permits that must be approved by Wyoming Department of Environmental Quality-Land Quality Division before a mine can begin operating. For example, the mining permits for both the North Antelope and Rochelle Mines include the following commitment:

The North Antelope and Rochelle Mines "will cooperate with the owner on site-specific mitigation plans for all existing water rights. A typical mitigation plan will include: documenting that drawdown has occurred, lowering the pump so that more water is available, and if necessary, installing a pump with a larger lift capacity. If further mitigation is needed" the North Antelope and Rochelle Mines "will drill a new well into the Fort Union Formation below the Wyodak-Anderson coal seam, and a solar pump or windmill will be installed. This mitigation plan will insure that no water rights will be adversely affected by mining operations."

The mining and reclamation permits also require monitoring to keep track of the impacts caused by surface coal mining.

Letter 6: Wyoming Game and Fish Department, Cheyenne, Wyoming

Comment 1. Public Land Access, Powder River Lease.

A number of federal/non-federal land exchanges between the United States Forest Service (USFS) and private interests have been accomplished or are in various stages of completion on the Thunder Basin National Grasslands. To date, Powder River Coal

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Company has participated in partnership with the USFS in fourteen proposed exchanges. Twelve of the exchanges, involving 60,693 acres, have been completed.

The most recent land exchange, known as the LLC Land Exchange (Fiddleback Ranch) involved private lands located in Converse and Campbell counties, Wyoming that are situated along Antelope Creek and the Cheyenne River south and southeast of the North Antelope and Rochelle mines.

Some of the benefits of this exchange that the USFS identified were:

The exchange would eliminate 56 isolated Federal parcels of land encompassing 13,367 acres and would create a nearly contiguous block of National Forest System land in excess of 50,000 acres.

The exchange would make eight parcels of State School Trust lands, encompassing 2600 acres, more accessible and usable by the general public.

Conflicts of crossing private lands to reach public lands would be decreased.

The loss of accessibility to public lands is long term, but it is not permanent. The public ownership of the surface does not change with the issuance of a lease to mine coal, and public access will be restored after mining and reclamation are completed.

Comment 2: Cumulative Impacts.

The statement referenced in your comment letter is in the introductory paragraphs to the cumulative impact analysis (Section 4.5, third paragraph, p. 4-25). It does not describe an impact, it describes the existing situation, i.e., that the number of acres and types of vegetation disturbed by mining varies from year to year. The cumulative vegetation and wildlife impacts are described in Sections 4.5.8 and 4.5.9. The impacts described in those sections include:

"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."

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

"Cumulative impacts to most wildlife will increase as additional habitat is disturbed but will moderate as more land is reclaimed."

"Lease of the LBA tracts would increase the area of habitat disturbance in the southern group of mines by 22%, and would enlarge the area where daily movement is restricted."

Letter 7: Wyoming State Historic Preservation Office, Cheyenne, Wyoming

As indicated in the draft and final EIS documents, cultural resource surveys have been conducted on both the Powder River and Thundercloud LBA tracts at the Class III level, and these reports have been submitted to your office.

Letter 8: Wyoming State Geological Survey, Laramie, Wyoming

Paragraph 1:

The soils in the LBA tracts and the potential environmental consequences of the chemical changes to the soil are described in Sections 3.4 and 4.1.3 of the draft and final documents. As indicated in those sections:

the reclaimed soils are more uniform in type, thickness and texture;

the most suitable soils are salvaged and used for reclamation;

since only the better soils are salvaged, the average quality of topsoil would be improved following reclamation.

Soils that are not suitable (and therefore not used as topsoil material during the reclamation process) include soils with high alkalinity, salinity or clay content.

Paragraph 2:

The Thundercloud tract was not surveyed for paleontological resources because rock outcrops and/or rock materials that could contain paleontologic remains are not present at the surface on that tract. This is now stated in the EIS.

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Paragraph 3

In the draft EIS document, the percentages of volatile matter and moisture content were rounded. The final EIS document has been corrected to include the more precise percentages.

Paragraph 4

The statement that bentonite is used in concrete has been removed in the final EIS. Concrete was included in the draft EIS because it is included in a "partial list of products in which bentonite is used, either in the processing of those products or directly in the products themselves" that was prepared for a BLM publication. In the paper "Bentonite Mining in the Black Hills Region", published in the 1988 Wyoming Geological Association Guidebook on the eastern Powder River Basin and Black Hills (page 312), it states: "Bentonite added to cements, mortars, and concretes suppresses the bleeding of water."

Paragraph 5

Table 5.2 has been revised.

Letter 9: Powder River Basin Resource Council, Sheridan, Wyoming,
December 1, 1997

Paragraph 1

The responses to the questions asked in paragraph 2 of your 10/27/97 comment letter explain the need for the coal in terms of the estimated remaining reserves and estimated remaining mine life at the North Antelope, Rochelle and Jacobs Ranch Mines, and the length of the leasing and permitting process. The fact that ARCO Coal Company is for sale does not mean that the Black Thunder Mine will cease to operate, or that it will not need additional reserves, and ARCO Coal Company was not for sale when Kerr-McGee applied for the Thundercloud tract. A decision has not been made to place either tract up for lease at this point in the process. It will be made by the authorized officer of the BLM, after review of the Powder River and Thundercloud DEIS, FEIS, and all public comments.

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Paragraph 2

Questions 1: Please include maps in the final EIS showing previous lease tracts and current mined out or mining areas.

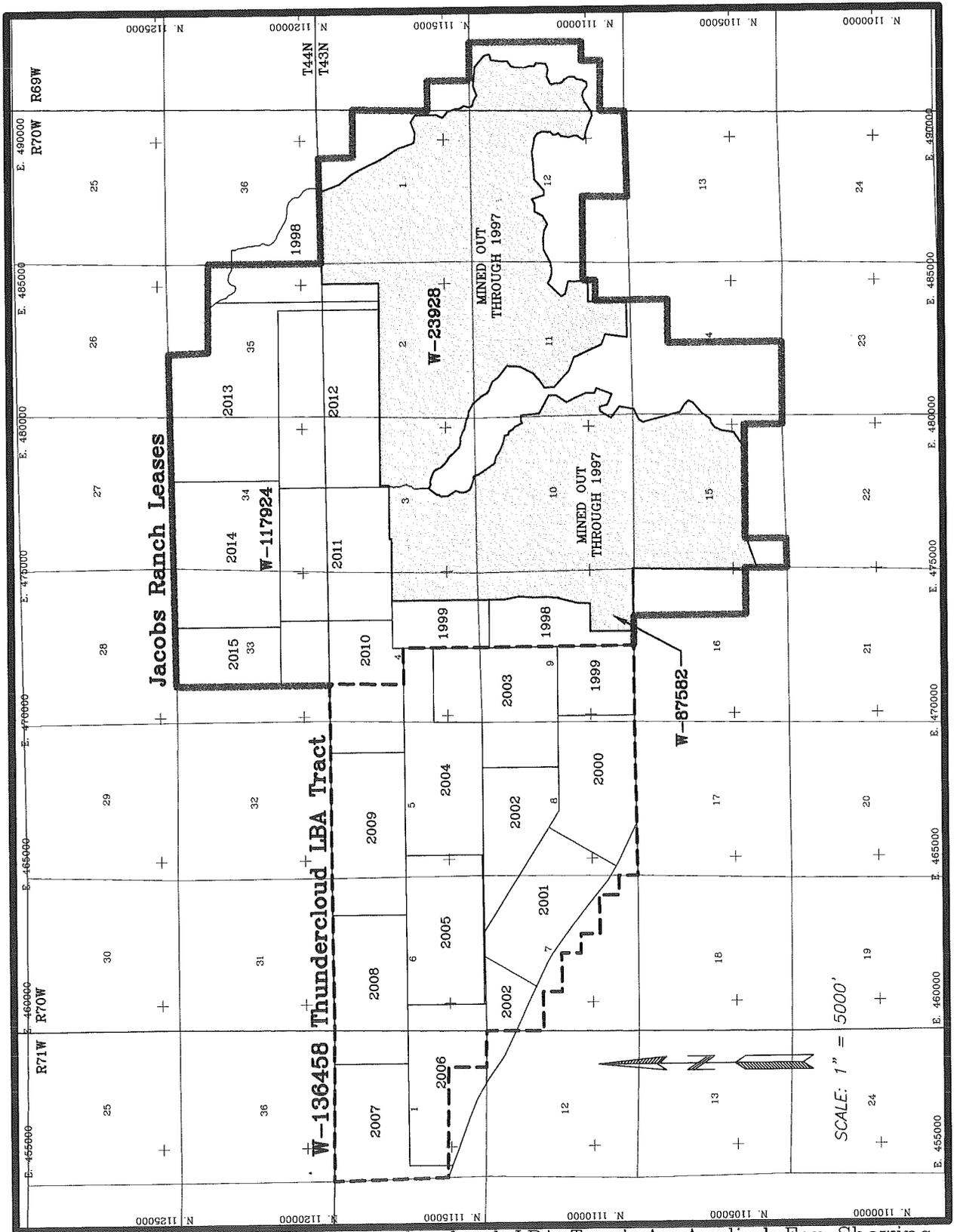
The remaining reserves at each mine are discussed on page 1-9 of the draft and final EIS documents, and the need for the coal is explained further in the responses to the questions asked in paragraph 2 of your 10/27/97 letter, as indicated under comment 1 above. Maps showing the mined out areas are included with this response. This information is reported in the Annual Reports filed for each mine with the Wyoming Department of Environmental Quality, Land Quality Division, and can be reviewed at their offices in Cheyenne and Sheridan.

Question 2: These leases appear to be speculative in nature and with the price of coal so low why is the BLM leasing at the time? BLM does not consider applications for maintenance coal leases to be speculative in nature. There are significant costs associated with acquiring a lease (e.g., data acquisition for the environmental analysis, data acquisition for the geologic report, bonus bids, etc.), which are not recoverable if the coal is not mined. Also, Congress included diligent development provisions in the Federal Coal Leasing Amendments Act of 1976 in order to deter speculative leasing of federal coal resources. The diligent develop provisions require that commercial quantities of federal coal be produced within 10 years of issuance of a federal lease. If Powder River Coal Company and Kerr McGee Coal Company (or anyone else) acquire these leases and do not mine commercial quantities within 10 years, they will lose the leases.

BLM evaluates leasing LBA tracts in response to applications received from companies with an interest in acquiring them. BLM has the responsibility and regulatory authority to require that the government receive fair market value for the coal.

Questions 3 & 4: Please discuss how the BLM values or prices that coal? Is the coal priced on the basis of overburden?

BLM is required to determine the fair market value of federal coal that is being considered for competitive sale. As defined at 43 CFR 3400.0-5(n): "Fair market value means that amount of cash, or on terms reasonably equivalent to cash, for which in all probability the coal deposit would be sold or leased



Proposed Mine Plan With Thundercloud LBA Tract As Applied For Showing Coal Removal By Year.

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

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." In order to evaluate the fair market value of the federal coal in the LBA tracts that are applied for, BLM independently prepares a detailed mining plan incorporating the existing leases owned by the applicant and the LBA tracts. That mining plan considers overburden thickness and composition, coal quality and thickness, projected mining rates, projected prices, mining methods used by the applicant to mine the coal, mining equipment owned by the applicant and the potential need for replacing that equipment, employment costs, and a number of other factors. BLM economists use this information to evaluate the cost of mining the coal in the LBA tract and the anticipated value of the coal when it is mined to help determine the fair market value.

Questions 5 & 6: How has the BLM considered or analyzed delaying leasing until the prices of coal improves or competition improves? Please include some discussion of the important issue of getting the best value for this public resource.

Delaying leasing of the coal until the price improves is considered in the DEIS and FEIS as Alternative 4 in Chapter 2. It is also in the response to questions 5 & 6 of paragraph 2 of your 10/27/97 comment letter. There is no way to predict if or when the price of coal is going to increase, but, if it does, the royalty that the government receives for the coal at the time it is sold, which is the main source of income for federal and state governments from the leasing and mining of federal coal, will increase as the price increases. If leasing is delayed until the price of coal is higher, the fair market value of the coal might be higher, which would mean that the bonus bid might be higher. However, the price increase may or may not last through the time the coal is permitted and can be mined, which is when the royalty would be paid.

Ninety-seven percent of the coal that is mined in Wyoming is used for power generation. Higher prices for Wyoming coal would benefit the coal companies and the treasuries of the state of Wyoming and the Federal government, but they would also probably lead to higher electricity prices, since the higher costs to generate the electricity would probably be directly passed on to the public that consumes it. As a result, an increase in coal prices could be accompanied by hardships for the part of the public that consumes the energy that is generated by burning

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

Wyoming coal in many parts of the country,

Paragraph 3:

Surface ownership of the lands included in the two LBA tracts is shown in Figures 3-12 and 3-13 of the draft and final EIS documents. Section 4.1.11 of the draft and final EIS documents states: "Hunting on the LBA tracts would be eliminated during mining and reclamation. Mining the LBA tracts would remove public access to approximately 1,240 acres of federal land on the Thundercloud LBA Tract and 2,675 acres of federal land on the Powder River LBA Tract." Section 4.3.11 of the draft and final EIS documents discusses PRCC's participation in a partnership with the US Forest Service to facilitate land exchanges in the Thunder Basin National Grasslands. These exchanges are also discussed in the response to comment 1 of Letter 6 from the Wyoming Game and Fish Department.

Paragraph 4:

Section 3.12 includes a general description of the cultural resources that have been found on both tracts. The sites are not described in detail nor are legal locations provided in order to protect them from unauthorized access, vandalism, and looting in accordance with provisions of the Archeological Resources Protection Act (ARPA).

Section 9(a) of ARPA states that "Information concerning the nature and location of any archaeological resource...may not be made available to the public under subchapter II of chapter 5 of Title 5 of the United States Code or under any other provision of law unless the Federal land manager concerned determines that such disclosure would (1) further the purposes of this Act...and (2) not create risk of harm to such resources or to the site at which such resources are located."

In other words, a government agency may make decisions to release cultural resource information if there is a benefit to doing so. Information on a cultural site can be released if the party it is being released to is qualified in some way to assist the agency with the site. For example, site information may be released to representatives of Native American tribes who can evaluate the significance of sites to their culture. The cultural resource mitigation process is discussed in Section 4.1.12 of the draft and final EIS documents, and the BLM and USFS stipulations concerning cultural resources that are added to federal coal leases are given in Appendix D of the draft and final EIS

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

documents.

As discussed in Section 4.3.12 of the EIS, Class I and Class III inventories are conducted on all lands included in the LBA tracts. All cultural sites identified in the inventory process are evaluated for eligibility for the National Register of Historic Places (NRHP). All sites that are determined to be eligible for the NRHP are avoided, or, if that is not possible, the data from the eligible sites are recovered.

It is possible that there are sites located on the tracts that are not visible prior to mining. Both BLM and USFS attach stipulations to federal coal leases requiring that the lessee notify the surface managing agency of cultural resources discovered during mining operations, and that those resources be evaluated prior to disturbing them. These stipulations, which are included in Appendix D of the EIS, also require that the cultural resource inventories be conducted by a qualified professional cultural resource specialist.

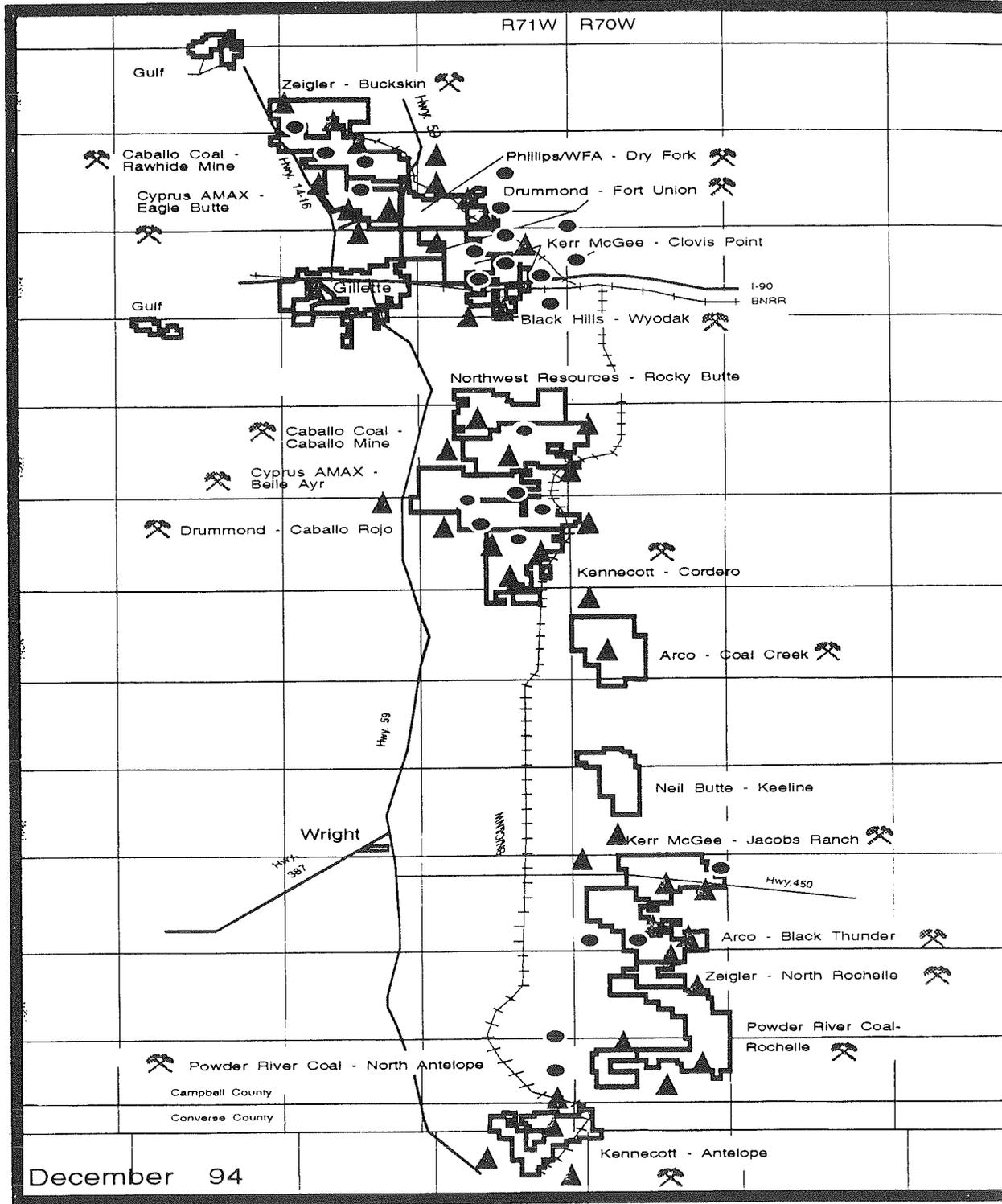
Letter 10: Environmental Protection Agency, Denver, Colorado

Comment 1:

A wind rose and map showing the air quality sampling locations at the existing adjacent mines is now included for each tract in Chapter 3 of the final EIS document. A map showing air quality monitoring sites for all of the mines in the Wyoming portion of the Powder River Basin is included with this response.

Comment 2:

There is little data on the gas content of the coals in the Powder River Basin, particularly in this area. U.S. Geological Survey Open-File Report 84-831, Coalbed Methane study of the 'Anderson' Coal Deposit, Johnson County, Wyoming - - - - A Preliminary Report by Donna L. Boreck and Jean N. Weaver does include coal gas desorption data from one core hole located in the western part of the Powder River Basin. In this core, the measured gas content ranged from 60 to 74 cubic feet per ton. The core hole is located in Johnson County, and the depth to the coal samples that were measured ranged from 1052 to 1226 feet.



AIR QUALITY MONITORING SITES



INACTIVE SITE



ACTIVE SITE



ACTIVE MINE

Source: Wyoming Department of Environmental Quality, Land Quality Division

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

The coal in the area of current coal bed methane production west of the mines is generally less than 400 feet below the surface. Gas content generally decreases as coal depth decreases because the gas is held in the coal by the hydrostatic pressure of the water in the coal and this pressure decreases as depth to the coal decreases. Therefore, the gas content of the coal in the area of coal bed methane production would be expected to be lower than that recorded deeper in the basin. Any estimate of the gas content at these shallower depths is complicated by the following factors:

1. Some of the coal bed methane being produced west of the mines appears to have already desorbed from the coal, but it is still trapped in the coal by the shales overlying the coal. It is more typical for the desorbed gas to migrate out of the coal, where it may be trapped in shallower porous zones or diffuse into the atmosphere.

2. The trapped, desorbed gas appears to be concentrated in structures in the coal rather than being uniformly distributed throughout the coal. As a result, the existing wells are drilled in "pods" located on the structures in the coal. It may become economically possible to expand the size of the producing pods by drilling lower on the coal structures after the existing producing wells reduce the water level in the coal and allow more gas to be desorbed, but that is not yet occurring.

3. There is currently no coal bed methane production in the vicinity of the Powder River and Thundercloud LBA tracts, and the potential in this area is unknown. Based on the existing production data, there are differences in production histories, estimated ultimate recoveries, and estimated well life for the coal bed methane wells north of Gillette versus those south of Gillette, and between coal bed methane wells in the same area. These differences are probably due to variations in: coal thickness, coal fracturing, the characteristics of the units overlying the coal which determine how effectively the gas is trapped in the hydrologic conditions in the coal, etc.

As indicated by the above discussion, it is difficult to estimate the amount of coal bed methane production that could be lost if the Powder River and Thundercloud tracts are mined prior to coal bed methane development. The following assumptions were

RESPONSES to COMMENT LETTERS RECEIVED ON THE POWDER RIVER AND THUNDERCLOUD DEIS

made based on the existing coal bed methane production data and drilling patterns in the productive area north of the LBA tracts:

1. Coal bed methane recovery west of the southern group of mines will be similar to established coal bed methane recovery west of the central group of mines.
2. The wells would be less than 400 feet deep, and the average per well production in a pod of production wells would range from 0.1 to 0.2 billion cubic feet (bcf).
3. The wells would be drilled on 40-acre spacing in pods occupying 20% to 30% of the LBA tracts. Under this assumption, the productive area on the Powder River LBA Tract would be 804 to 1,207 acres in size and 20 to 30 coal bed methane wells would be drilled on the tract. For the Thundercloud LBA Tract, the productive area would be 679 to 1,018 acres in size and 17 to 25 coal bed methane wells would be drilled on the tract..

Using these assumptions, potential coal bed methane production would range from 2 bcf to 6 bcf from the Powder River LBA Tract and from 1.7 bcf to 5 bcf from the Thundercloud LBA tract. This is a very uncertain evaluation, however, given the unknown potential in this particular area. Based on newspaper reports dating back to the early 1900s, methane has been encountered in more than a few shallow water wells in Campbell County. For example, the following stories appeared in the Gillette News-Record on 5/25/48 and 4/5/51, respectively: "*Vein of Gas Struck on L.C. Reed Ranch*", depth to gas 262 feet; "*Gas Struck in Water Well on Ted Barlow Ranch*", depth to gas 305 feet. Based on the reports that we know of, it appears that these encounters have occurred much more frequently in northern Campbell County than in southern Campbell County. This anecdotal evidence could indicate that, as a result of some geologic and/or hydrologic differences between northern and southern Campbell County, there is less gas trapped in the coal in the southern part of the county. One possible explanation is that the beds overlying the coal in the southern part of the county have been less effective in trapping the gas in the coal. If that is the case, the gas that has desorbed from the coal would have tended to migrate out of the coal and diffuse into the atmosphere instead of migrating into geologic traps in the coal. The potential production capacity of the area can not be evaluated with any reasonable certainty until coal bed methane wells are drilled and produced in this area.

Comment Responses-20

