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

Casper Field Office July 2003

FINAL
Environmental Impact Statement for the Pittsburg and Midway Coal Mining Company Coal Exchange Proposal
(WYW148816)

MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

Dear Reader:

The Bureau of Land Management (BLM) has prepared this Final Environmental Impact Statement (FEIS) to document and disclose the results of an environmental analysis of the proposed Pittsburg and Midway (P&M) Coal Exchange. A copy of this document is provided for your review and comments. The FEIS may also be viewed and downloaded from the BLM Wyoming website *www.wy.blm.gov*. Copies of the FEIS will also be available for public inspection at the following BLM offices:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82009

Bureau of Land Management
Casper Field Office
2987 Prospector Drive
Casper, WY 82604-2968

Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

Bureau of Land Management
Pinedale Field Office
432 E. Mill Street
Pinedale, WY 82941

Bureau of Land Management
Rawlins Field Office
1300 N. Third Street
Rawlins, WY 82301

The BLM analyzed two alternatives, the Proposed Action Alternative and the No Action Alternative. The FEIS analyzes a proposal by P&M to exchange privately owned land and some mineral resources for Federal coal. The proposed exchange includes the surface and mineral estate on the parcels which would become Federal estate administered by the USDA Forest Service, Bridger-Teton National Forest (BTNF), (2,447.88 acres); and on 638.37 acres to be administered by BLM and adjacent to the BTNF. BLM would acquire 2,772.25 acres of surface to be administered in the BLM Rawlins and Buffalo Field Offices and 807.69 acres of coal to be administered by the Buffalo Field Office. If the Proposed Action Alternative is selected, the decision to amend the Pinedale Resource Management Plan (RMP), the Rawlins RMP, and the Buffalo RMP would be included.

Under the 43 Code of Federal Regulations (CFR) 2200-Exchanges, lands acquired by the BLM through an exchange automatically become public lands and then managed under the applicable RMP.

- The Pinedale RMP would be maintained to add the Bridger Lands parcel to the identified public lands base. In that the Bridger Lands are contiguous with BLM-administered public lands, those acquired lands would assume the management prescriptions and decisions made for the adjacent BLM lands.

- The Rawlins RMP would be maintained to add the JO Ranch Lands to the identified public lands base. In that the JO Ranch Lands are surrounded by BLM lands, those acquired lands would assume the management prescriptions and decision made for the surrounding BLM lands.

- The Buffalo RMP would be maintained to add the Welch Ranch Lands to the identified public lands base. In that the Welch Ranch Lands parcel is isolated from other public lands and surrounded by private lands, the Buffalo Field Office proposes to analyze alternatives for management in a separate plan amendment process once the exchange is completed.

The BLM will accept public comments on this FEIS, for 30 days commencing on the date the Environmental Protection Agency (EPA) publishes its Notice of Availability in the Federal Register. Comments received after the end of the 30-day comment period will be considered in preparation of the FEIS as time permits.

If you wish to comment on the FEIS, your comments should relate directly to the document. We request that you make your comments as specific as possible and that you cite the location, or locations, in the document on which you are commenting. Substantive comments should: (1) give any new information which could alter conclusions; (2) show why or how analysis or assumptions in the FEIS are flawed; (3) show errors in data, sources, or methods; or (4) request clarifications that bear on conclusions. Comments that contain only opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision-making process.

To address possible environmental and socioeconomic impacts that could result from completing this proposed exchange this FEIS was prepared pursuant to the National Environmental Policy Act and other applicable regulations, and statutes. This FEIS is not a decision document. Its purpose is to inform the public of the impacts of a proposed exchange of Federal coal and to evaluate alternatives to exchanging the coal.

Prior to making a decision on whether to approve or disapprove this exchange, the BLM Wyoming State Director will make a determination that the exchange will, or will not be, in the public interest after considering the factors listed under 43 CFR 2200.0-6 (b), the analysis in this FEIS, and the appraisals that are current at that time.

After completion of the FEIS and prior to making a public interest determination and issuing a notice of decision, the BLM will hold a public hearing to receive public comments on the public interest factors on the proposed exchange, as required under 43 CFR 2203.3. A public interest determination hearing will be held at Sheridan College, 3059 Coffeen Ave., Whitney Building, Room W-136, Sheridan, Wyoming 82801, on August 27, 2003, from 7 to 9 p.m.

Public comments, including the names and street addresses of respondents, will be available for public review at the address listed below during regular business hours (7:45 a.m.- 4:30 p.m.), Monday through Friday, except holidays. Public comments will be published as part of the Record of Decision issued for the FEIS. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Please retain this copy of the FEIS for future reference. Send written comments to BLM Casper Field Office, Attn: Nancy Doelger, 2987 Prospector Drive, Casper, WY 82604. Written comments may also be mailed electronically to the attention of Nancy Doelger at *casper_wymail@blm.gov*. Electronic mail comments must include the name and mailing address of the commenter to receive consideration. Written comments may also be faxed to 307-261-7587, and must include the name and mailing address of the commenter to receive consideration.

If you have any questions or would like to obtain additional copies of this FEIS, please contact Nancy Doelger at 307-261-7627, or at the above address.

Sincerely,

Robert A. Bennett
State Director

PROTEST PROCEDURES

The BLM Planning Regulations, 43 CFR 1610.5-2, state that any person who participated in the planning process, and has an interest that may be adversely affected, may protest. A protest may only raise those issues that were submitted for the record during the planning process. The protest must be filed within 30 days of the date the Environmental Protection Agency publishes the notice of receipt of the Final Environmental Impact Statement (FEIS), in the Federal Register.

E-mail protests will not be accepted. Faxed protests will be considered as potential valid protests provided (1) the signed faxed letter is received by the BLM Washington Office protest coordinator by the closing date of the protest period, and (2) the protesting party also provides the original letter by either regular or overnight mail postmarked by the close of the protest period.

All protests must be sent in writing to:

Regular Mail
Director, Bureau of Land Management
Attn: Ms. Brenda Williams, Protest Coordinator
P.O. Box 66538
Washington D.C. 20035

Fax Mail
Director, Bureau of Land Management
Attn: Ms. Brenda Williams, Protest Coordinator
Fax Number: 202-452-5112

Overnight Mail
Director, Bureau of Land Management
Attn: Ms. Brenda Williams, Protest Coordinator
1620 L Street, N.W., Room 1075
Washington D.C. 20036
Telephone: 202-452-5045

Protests filed or postmarked after the closing date, or filed with the State Director or Field Manager, shall be rejected. There is no provision for any extension of time for the 30-day protest period provided in the planning regulations.

The resolution of protests is the responsibility of the Director of the BLM whose decision is the final decision of the Department of the Interior. The decision will be in writing and set forth the reasons for the decision. The decision will be sent to the protesting party by certified mail, return receipt requested.

A protest must contain:
1. The name, mailing address, telephone number, and interest of the person filing the protest.
2. A statement of the issue or issues being protested.
3. A statement of the part or parts of the plan being protested.
4. A copy of all documents addressing the issue, or issues, which were submitted during the planning process by protesting party or an indication of the date the issue or issues were discussed for the record.
5. A concise statement explaining why the State Director's decision is believed to be wrong.

Written protests that are filed with the BLM Director may be subject to disclosure under the Freedom of Information Act. Individuals may request confidentiality. If you wish to withhold your name or street address from public review or disclosure you must state this prominently at the beginning of your written protest. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives of officials or organizations or businesses, will be made available for public inspection in their entirety.

FINAL

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

Prepared for

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

and

Cooperating Agencies

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

and

U.S. Department of the Interior
Forest Service
Bridger-Teton National Forest
Kemmerer, Wyoming

by

WWC Engineering
Sheridan, Wyoming

JUNE 2003

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Abbreviations and Acronyms Used in this Report

AAQS	Ambient Air Quality Standards
ac-ft	acre-foot, acre-feet
ACEC	Area of Critical Environmental Concern
AML	Abandoned Mine Lands
AMLD	Abandoned Mine Lands Division
ANC	acid neutralizing capacity
ANFO	ammonium nitrate and fuel oil
APD	Application for Permit to Drill
APE	Area of Potential Effect
AQRV	Air Quality Related Values
AUM	Animal Unit Month
AVF	Alluvial Valley Floor
BACT	Best Available Control Technology
bcy	bank cubic yards
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe
BOGC	Board of Oil and Gas Conservation
BP	before present
BTNF	Bridger Teton National Forest
Btu/lb	British thermal units per pound
C	Celsius
ca	circa
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CBM	coal bed methane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	cubic foot per second
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
dBA, dB(A)	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DFC	Desired Future Condition
DM&E	Dakota, Minnesota & Eastern Railroad Corporation
DNRC	Department of Natural Resources and Conservation
DOI	Department of the Interior
dscf	dry standard cubic foot
dv	deciview, a measure of view impairment
EA	Environmental Assessment
EIA/DOE	Energy Information Administration/Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EQC	Environmental Quality Council
ESA	Endangered Species Act
F	Fahrenheit
FDM	Fugitive Dust Model
FEIS	Final Environmental Impact Statement
FLAG	Federal Land Managers Air Quality Related Values Work Group
FLM	Federal Land Manager

Abbreviations and Acronyms Used in this Report

FLPMA	Federal Land Policy Management Act of 1976
ft	feet, foot
ft^3	cubic feet
ft/day	feet per day
g	gram
GLO	General Land Office
gpm	gallons per minute
HAP	hazardous air pollutant
hp	horsepower
hr	hour
ISC3	U.S. EPA's Industrial Source Complex
km	kilometers
LAC	limits of acceptable change (i.e., air quality)
LBA	Lease by Application
LNCM	Lands Necessary to Conduct Mining
LOM	Life of Mine
LOP	Life of Project
LPI	early part of the Late Prehistoric Period
LPII	latter part of the Late Prehistoric Period
LRMP	Land and Resource Management Plan
MBHFI	migratory birds of high federal interest
MBMG	Montana Bureau of Mines and Geology
MCF	thousand cubic feet
MDEQ	Montana Department of Environmental Quality
MDEQ/AWM	Montana Department of Environmental Quality/Air and Waste Management Bureau
MEI	maximally exposed individual
mg/l	milligrams per liter
MLA	Mineral Leasing Act of 1920
MLE	most likely exposure
mm	millimeter
MM4	mesoscale model
mph	miles per hour
MSA	Metropolitan Statistical Area
MSHA	Mining Safety and Health Administration
MT	Montana
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAPG	North American Power Group
NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act of 1969
NIOSH	National Institute of Occupational Safety and Health
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
O_3	photochemical oxidants
OSHA	Occupational Safety and Health Administration

Abbreviations and Acronyms Used in this Report

OSM, OSMRE	Office of Surface Mining Reclamation & Enforcement
P&M	Pittsburg & Midway Coal Mining Company
Pb	lead
PECS	passive enclosure control systems
PILT	Payment in Lieu of Taxes
P.M.	Prime Meridian
$PM_{2.5}$	inhalable particulate matter finer than 2.5 microns in effective diameter
PM_{10}	inhalable particulate matter finer than 10 microns in effective diameter
ppbv	parts per billion by volume
ppm	parts per million
ppmv	parts per million by volume
PRB	Powder River Basin
PRRCT	Powder River Regional Coal Team
PSD	Prevention of Significant Deterioration
PSO	Public Services Company of Oklahoma
PTE	potential-to-emit
RH	relative humidity
ROD	Record of Decision
SAR	sodium adsorption ratio
SARA	Superfund Amendment & Reauthorization Act of 1986
SEO	State Engineer's Office
SHPO	State Historic Preservation Office
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO	state office
SO_2	sulfur dioxide
T&E	Threatened and Endangered
TBCC	Thunder Basin Coal Company
TDS	total dissolved solids
tpd	tons per day
tpy	tons per year
TSP	total suspended particulates
U.S.	United States
USC	United States Code
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDC, BC	U.S. Department of Commerce, Bureau of the Census
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UW	University of Wyoming
VOCs	volatile organic compounds
VRM	visual resource management
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations
WDEQ	Wyoming Department of Environmental Quality
WDEQ/AQD	Wyoming Department of Environmental Quality/Air Quality Division

Abbreviations and Acronyms Used in this Report

WDEQ/LQD	Wyoming Department of Environmental Quality/Land Quality Division
WGFD	Wyoming Game and Fish Department
WMA	Wyoming Mining Association
WOGCC	Wyoming Oil and Gas Conservation Commission
WRCC	Western Regional Climate Center
WSGS	Wyoming State Geological Survey
WY	Wyoming
µeq/L	microequivalents per liter
µg/m^3	micrograms per cubic meter
µmhos/cm	micromhos per centimeter

EXECUTIVE SUMMARY

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

P&M owns approximately 5,858.5 acres of surface estate and portions of the mineral estate on the lands in Lincoln, Carbon, and Sheridan Counties, Wyoming, shown in Figures ES-2, ES-3, and ES-4. They are offering to exchange their ownership in these lands for federal coal rights in Sheridan County in the tract shown in Figure ES-5.

Figure ES-2 shows the lands P&M is offering to exchange in Lincoln County, referred to here as the Bridger lands. If the exchange is completed as proposed, P&M would transfer approximately 3,086 acres of surface estate and 3,086 acres of mineral estate to U.S. ownership. Approximately 2,446 acres are situated within the BTNF and would be administered by the USFS if an exchange is completed. Approximately 638 acres are located outside the BTNF and would be administered by the BLM if an exchange is completed.

Figure ES-3 shows the lands being offered by P&M in Carbon County, referred to as the JO Ranch lands. If the exchange is completed as proposed, P&M would transfer approximately 1,233.5 acres of surface estate to U.S. ownership. P&M does not own the mineral estate under the JO Ranch lands. If the exchange is completed, the surface estate of these lands would be administered by BLM, and the mineral ownership would not change.

Figure ES-4 shows the Sheridan County lands being offered by P&M, referred to as the Welch lands. If the exchange is completed as proposed, P&M would transfer approximately 1,539 acres of surface estate and 808 acres of coal estate to U.S. ownership. If the exchange is completed, the surface and coal estate of these lands would be administered by BLM and the rest of the mineral ownership would not change.

Figure ES-5 shows the federal coal tract P&M seeks to acquire by exchange for the properties described above. It includes approximately 2,045.5 acres of land referred to as the PSO Tract in this EIS. Figure ES-5 also shows the lands north of Sheridan, Wyoming where P&M owns the surface. P&M owns the surface of most, but not all, of the PSO Tract. There are several other private surface owners and there are 6.41 acres of public land in the tract, located in Section 15, T.58N., R.84W. The coal beneath the PSO Tract is unleased federal coal, for which BLM is the managing agency. If an exchange is

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

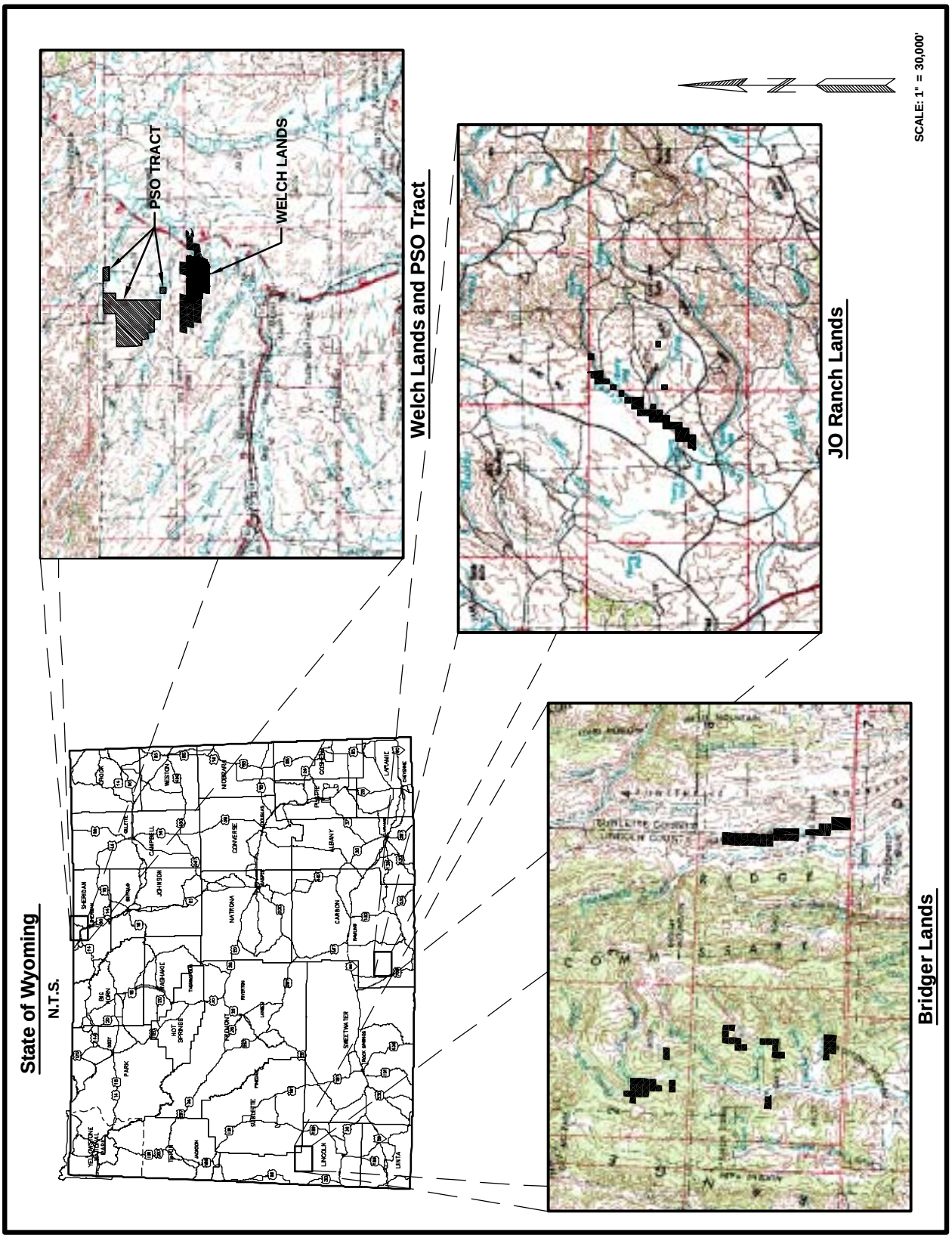


Figure ES-1. General Location of Lands Being Offered for Exchange by P&M and the PSO Tract.

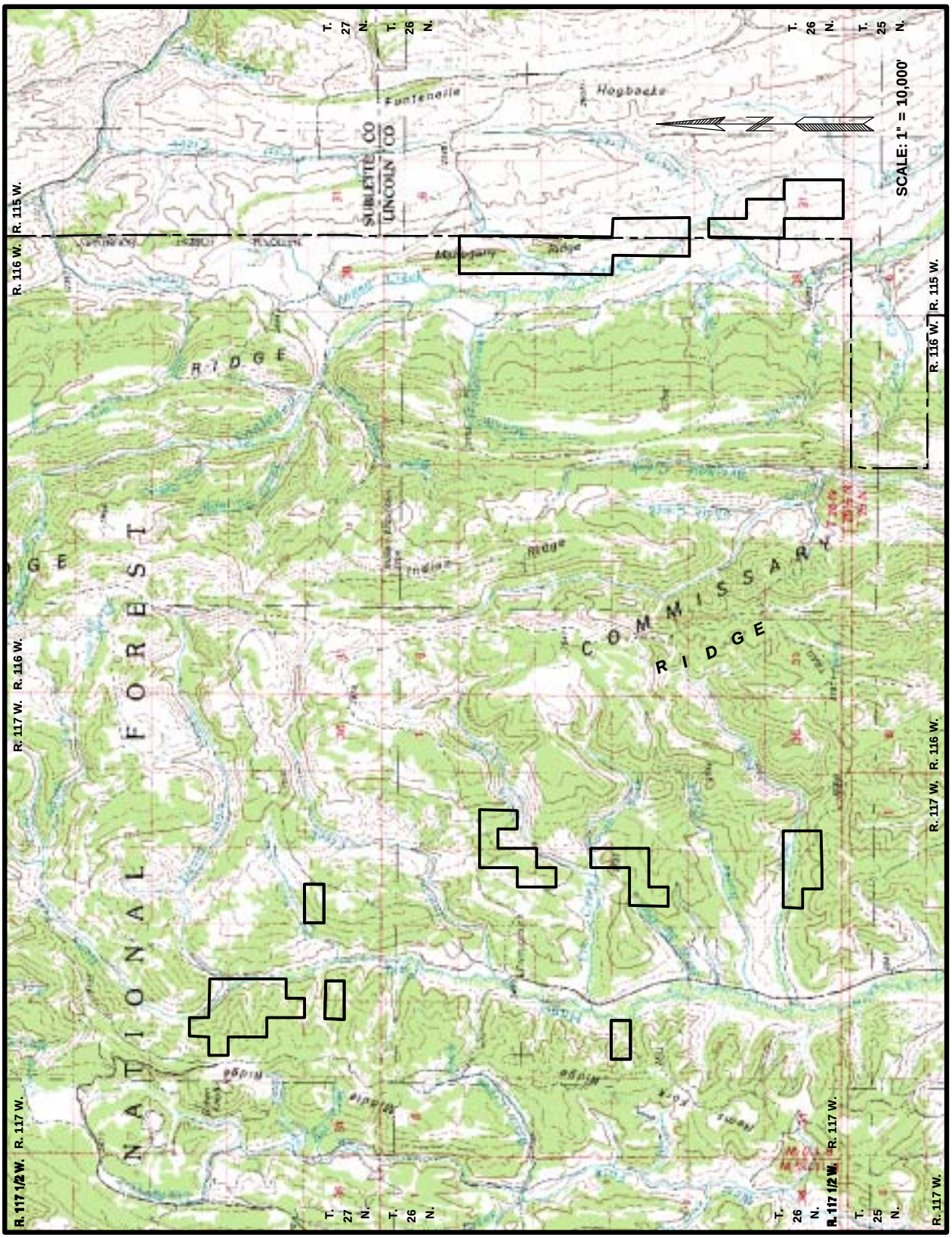


Figure ES-2. Bridger Lands Location Map.

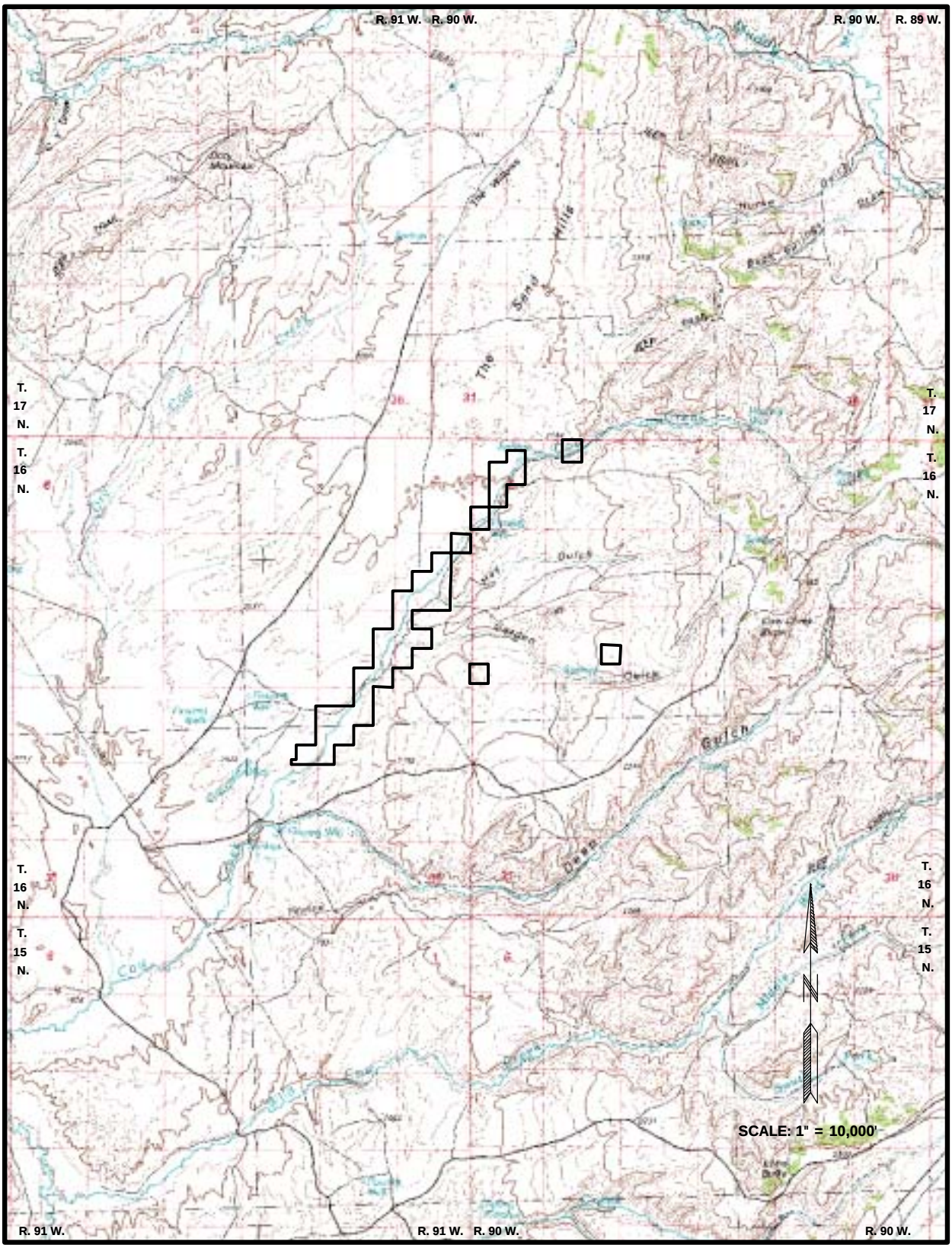


Figure ES-3. JO Ranch Lands Location Map.

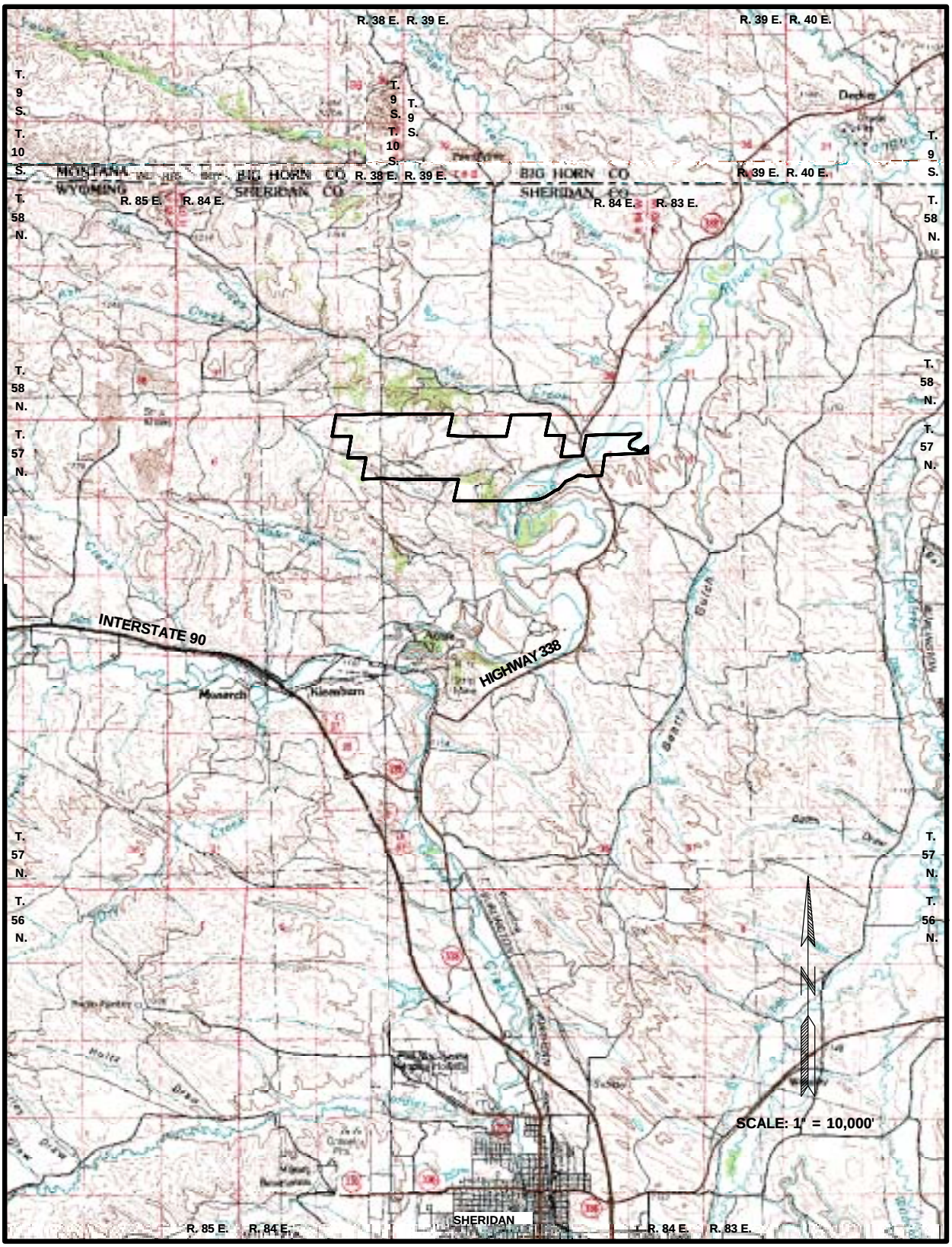


Figure ES-4. Welch Lands Location Map.

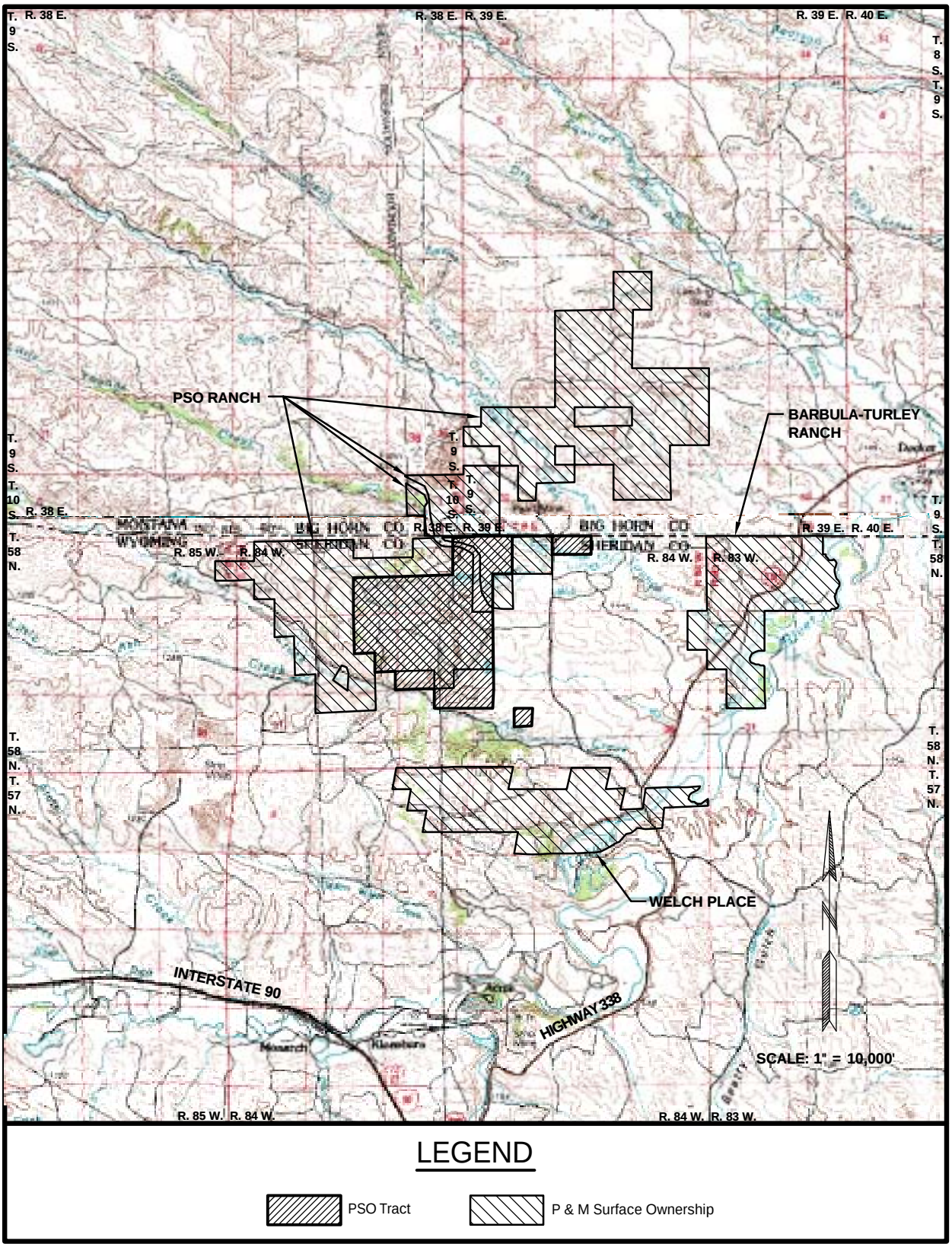


Figure ES-5. Location of P & M Surface Lands and PSO Tract.

completed, BLM would transfer ownership of the coal to P&M. P&M has indicated that, if the exchange is completed, they propose to open a surface coal mine to recover the coal reserves in the PSO Tract. For the purposes of this EIS, the coal mine that P&M proposes to open is referred to as the proposed Ash Creek Mine.

The exchange is being processed under the provisions of Section 206 of FLMPA, the Federal Land Exchange Facilitation Act, Public Law No. 106-248, and the regulations at 43 CFR 2200. The PRRCT reviewed the exchange proposal at a public meeting held on October 27, 1999 in Gillette, Wyoming.

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

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

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

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

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

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

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

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

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

This draft EIS analyzes two alternatives: the Proposed Action and Alternative 1, which is the No Action Alternative.

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

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

The Proposed Action assumes that P&M would mine the coal in the PSO Tract. Figure ES-6 is a schematic mine plan for the proposed Ash Creek Mine prepared by P&M. P&M estimates that there are 107 million tons of recoverable federal coal in the PSO Tract. P&M proposes to expand into adjacent private coal reserves during the later part of the mine life, as shown in Figure ES-6. However, P&M does not currently own that coal and does not have an arrangement with the owner to mine the coal. P&M proposes to mine the coal with

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

	Proposed Action			No Action Alternative	
Tract	**Surface Estate (acres)**	**Mineral Estate (All Minerals) (acres)**	**Mineral Estate (Coal Only) (acres)**	**Surface Estate (acres)**	**Mineral Estate (acres)**
Bridger	3,086.25	3,086.25	0.00	0.00	0.00
JO Ranch	1,233.55	0.00	0.00	0.00	0.00
Welch	1,538.70	0.00	807.69	0.00	0.00
Total	5,858.50	3,086.25	807.69	0.00	0.00

shovel and truck equipment similar to those commonly utilized in the industry at other surface coal mines in the PRB. They propose using an overland conveyor to transport coal to a unit train loadout facility on the BNSF mainline due south of the operation. After the coal is removed, the mined-out area would be reclaimed in accordance with SMCRA and Wyoming State Law.

Alternative 1 is the No Action Alternative. Under this alternative, the exchange would not be completed. If the No-Action Alternative is selected, it is assumed that the federal coal in the PSO Tract would not be mined in the foreseeable future. Selection of this alternative would not preclude leasing of this federal coal in the future. Under the No-Action Alternative, it is also assumed that the Bridger lands, JO Ranch lands, and Welch lands would remain in private ownership. P&M has indicated that, if the exchange is not completed, it would consider subdividing the properties and offering them for public sale in order to maximize their value.

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

Other alternatives that were considered but not analyzed in detail assume government purchase of the offered lands from P&M using funds acquired by leasing the coal in the PSO Tract or by obtaining an appropriation through a source such as the Land and Water Conservation Fund. However, P&M has stated that it is not offering and does not intend to sell their properties to BLM and Forest Service at the appraised value being considered in the exchange. P&M has indicated that it would sell the lands on a competitive bid basis if the exchange is not completed. Therefore, these alternatives were not analyzed in detail.

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

Critical elements of the human environment (BLM 1988) that could potentially be affected by the proposed action include air quality, cultural resources, Native American religious concerns, T&E species,

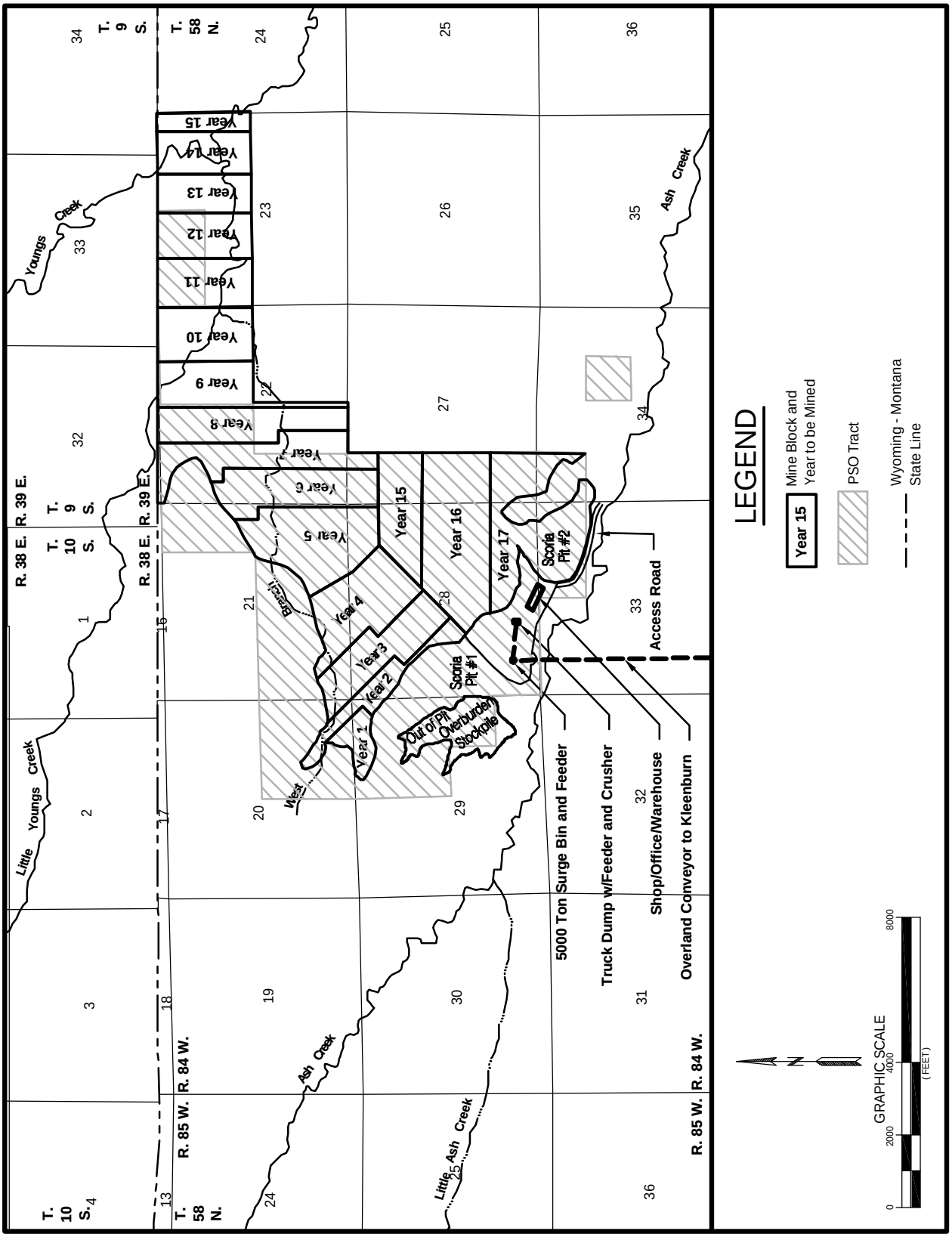


Figure ES-6. Schematic Mine Plan for the Ash Creek Mine.

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

Item	**Proposed Action**	**No Action Alternative**
Mineable Federal Coal	112.5 million tons	none
Recoverable Federal Coal[1]	107.0 million tons	none
Area of Federal Coal Exchanged	2,045.53 acres	none
Area of Federal Coal to be Mined	1,244 acres	none
Total Area to be Disturbed by Coal Mining[2]	2,595 acres	none
Average Annual Coal Production	10 million tons	none
Average Number of Employees	70	none
Total Projected State Revenues[3]	$ 99.0 million	none
Total Projected Annual Revenues to Sheridan County[4]	$ 6.0 million	none
Total Projected Federal Revenues[5]	$ 53.0 million	none

1 Assumes 95 percent of mineable coal is recovered.

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

3 Projected revenue to State of Wyoming is $0.75 per ton of coal sold. Includes income from severance taxes, property and production taxes, sales and use taxes, and excludes Wyoming's share of federal royalty payments (UW 1994) (refer to Section 4.4.19 of this EIS), plus $0.35 per ton of coal sold for AML fees minus U.S. Government's 50 percent share.

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

5 Federal revenues are based on a coal price of $8.00 per ton u amount of recoverable coal u black lung tax of 4.0 percent, plus $0.35 per ton for AML fees u amount of recoverable coal minus the State's 50 percent share.

Note: All figures in this table are for the PSO Tract only.

hazardous or solid wastes, water quality, wetlands/riparian zones, floodplains, invasive non-native species, environmental justice, and areas of critical environmental concern. Prime or unique farmlands, wild and scenic rivers, and wilderness are not present in the project areas. The following paragraphs discuss the resources of the lands involved in the proposed exchange and the potential impacts if the exchange is completed as proposed.

The Bridger Lands (Figure ES-2) are characterized by northerly trending ridges and valleys. Perennial and ephemeral streams which are tributaries to Hams Fork and Fontenelle Creek flow through portions of some of the lands. The Bridger lands include habitat for many species including elk, mule deer, moose, mountain lion, and black bear. The streams may be occupied by Colorado River cutthroat trout. Threatened, endangered, and proposed species that USFWS has identified as potentially present in this area include bald eagle, Canada lynx, Ute-ladies' tresses, black-footed ferret, gray wolf, and mountain plover. Candidate species that USFWS has identified as potentially present in this area include black-tailed prairie dog, western boreal toad, yellow-billed cuckoo, and Arctic grayling. In addition, USFWS requested that potential impacts to endangered Colorado River Fish Species be considered if the Proposed Action would lead to water depletion in the Colorado River System. The Bridger lands are suitable for or have been used for recreational purposes including hunting, fishing, camping, hiking, wildlife observation, off-road vehicle use, and photography. There is no existing mineral development on these lands.

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

The JO Ranch Lands (Figure ES-3) are located in southwest Carbon County, Wyoming, along the valley of Cow Creek, a tributary of the Little Snake River. The northern portion of the JO Ranch lands is within the area known as the Sand Hills. The lands include crucial winter range for elk and mule deer. The portion of Cow Creek included in the exchange could include habitat for non-game BLM sensitive fish species such as roundtail chubs, flannelmouth suckers, and bluehead suckers. Threatened, endangered, and proposed species that USFWS has identified as potentially affected by the Proposed Action include bald eagle, black-footed ferret, Canada lynx, Ute-ladies' tresses, mountain plover, blowout penstemon, endangered

Colorado River Fish Species and threatened or endangered Platte River Species. Candidate species that USFWS has identified include black-tailed prairie dog, western boreal toad, yellow-billed cuckoo, and Arctic grayling. The JO Ranch lands include ranch buildings which are eligible for National Historic Site status. The lands have been used for livestock and supplemental hay production and are suitable for or have been used for hunting, camping, hiking, rock hounding, wildlife observation, off-road vehicle use, outdoor photography, and scenic touring. Some oil and gas development has occurred in the area of the JO Ranch lands.

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

The Welch Lands (Figure ES-4) are located in north-central Sheridan County and occupy a portion of the Tongue River valley floor and adjacent dissected uplands. Wildlife species observed or known to frequent the area include antelope, mule deer, white-tailed deer, coyote, fox, pheasant, sharp-tailed grouse, turkey, bald eagle, mountain lion, black bear, bobcat, and elk. This portion of the Tongue River contains small-mouth bass, sauger, walleye, catfish, brown trout, and numerous non-game species. Threatened, endangered, and proposed species that USFWS has identified as potentially present in this area include bald eagle, black-footed ferret, Canada lynx, Ute-ladies-tresses and mountain plover. Candidate species that USFWS has identified include black-tailed prairie dog, western boreal toad, yellow-billed cuckoo, and Arctic grayling. The property has historically been used principally for livestock grazing and crop production. Recreational opportunities include hunting, hiking, biking, photography, and fishing.

There has been no oil and gas exploration or development on these lands, but CBM development is occurring in this area. The Welch lands are underlain by coal, and there is a long history of coal mining in this area. An underground coal fire is currently burning on a portion of the Welch lands. This coal seam fire is probably related to the underground coal fires at the abandoned Acme Mine No. 42. This abandoned underground mine was active from 1911 through 1940 and

its mining operations extended onto the southern part of the Welch lands. The underground coal seam fire occupies approximately 13 acres in the SW¼ of Section 2, T.57N., R.84W. BLM is evaluating several tract configuration options for the Welch lands that would exclude the underground coal fire area from the lands that the federal government would acquire. If the exchange is completed, BLM's Preferred Alternative is to acquire all of the Welch lands that P&M is offering.

A wild fire, the Thunder Child Range Fire, burned 5,207 acres, including portions of the Welch lands, in late July of 2001. The fire originated in the vicinity of the underground coal seam fire in the SW¼ of Section 2, T.57N., R.84W. The cause of the fire is undetermined, but potential causes include a lightning storm and/or the underground coal seam fire.

If the exchange is completed as proposed, the Welch lands would become public lands. The BLM would also acquire about 800 acres of coal estate. The remainder of the coal estate underlying the Welch lands is federal. The rest of the mineral estate underlying the Welch lands, including the oil and gas estate, is privately owned and that mineral ownership would not change if the exchange is completed. The BLM Buffalo Field Office would determine future management with public input, through additional NEPA analysis and planning decisions. Public access would be ensured. Since the Welch lands include a portion of the Tongue River, the property has high potential for public recreation. The BLM does not plan to change the existing management of the Welch lands. BLM has identified several options for management of the area occupied by the underground coal seam fire, if the exchange is completed. These options range from reclaiming the fire or completely fencing off the coal seam fire area from public access and posting warning signs to managing and monitoring the fire for research or showcasing the area as an example of coal seam burning processes.

The PSO Tract (Figure ES-5) is located in the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. The PSO Tract is located in the northwest part of the basin, several miles north of the Welch lands that P&M is offering for exchange (see Figure ES-1). In the PSO Tract, there are two mineable coal seams, referred to as the Dietz 1 and 3 seams. The Dietz 1 coal seam is present in the northern half of the tract and ranges from 5 ft to 20 ft in thickness. The Dietz 3 coal seam is present across the proposed mining area and averages 41 ft in thickness. The overburden ranges from 20 to 275 ft. The interval between the two coal seams thickens from east to west and ranges from 20 to 140 ft. Two northeast-trending structural faults outline the northwest and southeast boundaries of the proposed mining area (see Figure ES-7). Based on recent drilling done by P&M, the Dietz 1 average heating value is 9,279 Btu/lb with 5.8 percent ash and 0.44 percent sulfur. The Dietz

3 average heating value is 9,352 Btu/lb with 5.4 percent ash and 0.53 percent sulfur.

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

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

The geology from the base of the lowest coal proposed for mining to the land surface would be subject to permanent change on the PSO Tract under the Proposed Action. The replaced overburden would be a relatively homogeneous mixture compared to the premining layered overburden and coal.

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

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

Moderately adverse short-term impacts to air quality would occur during the time the PSO Tract is mined if the exchange is completed and a mine is opened. PM_{10} and NO_2 levels would be elevated at dwellings and along roads in the vicinity of the proposed Ash Creek Mine during mining operations, but federal and state primary and secondary standards would not be violated outside the mine=s permit boundary. Dust may be visible to the public from State Highway 338. The WAQSR require the use of BACT for the mitigation of all contaminants released to the

atmosphere. In the case of large surface coal mines, Chapter 6, Section 2 of the WAQSR (and long-term WDEQ/AQD policy) provides that BACT would typically include watering and chemical treatment of haul roads, silos or similar enclosures for out-of-pit coal storage, use of high efficiency baghouses or similar controls on preparation plant process sources, and other best management practices.

One air quality issue of current concern in the area of existing coal mining in Campbell and Converse Counties, Wyoming is the release of NO_x from blasting and the resulting formation of low-lying orange clouds that can be carried outside the mine permit areas by wind. As a result of this concern, industry has conducted monitoring studies of the contents of the gaseous clouds and has cooperated in research on blasting agents and blasting size aimed at reducing emissions during blasting. WDEQ has required some existing mines in Campbell County to take steps designed to mitigate the effect of the gaseous emissions during blasting. The likelihood that there would be a high risk posed to the public or to mine employees by the release of NO_2 from blasting at the proposed Ash Creek Mine is minimal because the proposed Ash Creek Mine would not employ cast blasting and the overburden and interburden strata in the proposed Ash Creek Mine area are not saturated.

The West Branch of Little Youngs Creek lies within the PSO Tract (see Figure ES-6). Little Youngs Creek is a tributary to Youngs Creek, which is a tributary to the Tongue River. West Branch is an ephemeral stream and a portion of the stream may have some AVF characteristics.

Changes in runoff characteristics and sediment discharges would occur during mining of the PSO Tract, and erosion rates could reach high values on the disturbed areas because of vegetation removal. However, state and federal regulations require that surface runoff from mined lands be treated to meet effluent standards, so sediment would be deposited in ponds or other sediment-control devices. During mining, disruptions to streamflow in Little Youngs and Youngs Creeks, which might affect adjacent landowners downstream of the PSO Tract, would not be expected to be substantial. After mining and reclamation are complete, surface water flow, quality, and sediment discharge would approximate premining conditions.

Mining the PSO Tract would cause lowered water levels in the coal and overburden aquifers, and the existing coal and overburden aquifers would be replaced by mine backfill. The faults bounding the mine area on the northwest and southeast act as barriers to groundwater flow in those directions; and the Dietz 1 and Dietz 3 coal seams are absent to the southwest due to erosion and burning. Therefore, drawdown in the coal aquifers would be expected to extend only to the northeast for any appreciable distance from the mine. The predicted drawdown over

the life of the mine is shown in Figure ES-7. TDS concentration levels in the saturated backfill would initially be expected to be higher than in the pre-mining aquifers, but would be expected to meet the pre-mining Wyoming Class III standards for use as stock water. The data available on hydraulic conductivity suggest that wells completed in the backfill would provide yields greater than or equal to pre-mining coal wells.

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

Jurisdictional wetlands inventories completed on the PSO Tract in 2001 identified 6.2 acres of jurisdictional wetlands associated primarily with man-made stock ponds. Jurisdictional wetlands that are disturbed by mining must be replaced during the reclamation process.

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

Three big game species, pronghorn, mule deer, and white-tailed deer, occur in the vicinity of the PSO Tract. Black bear and mountain lion have been recorded in the area but are not common. Numerous raptor species have been observed on or adjacent to the tract with two species, red-tailed hawk and great horned owl, recorded as nesting on the tract. An active sage grouse

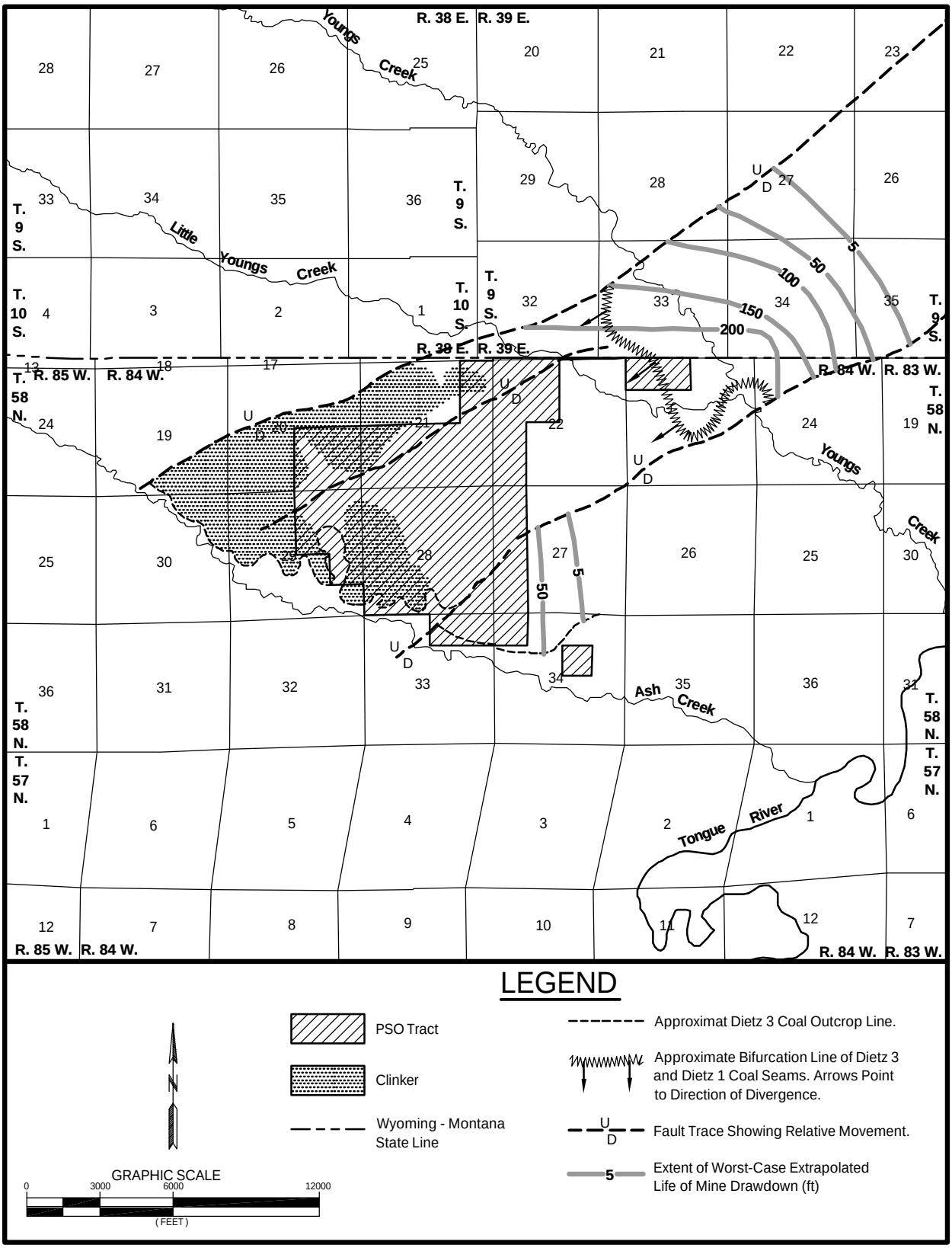


Figure ES-7. Life of Mine Drawdown Map, Resulting from Proposed Action.

strutting ground is present on the tract. Threatened, endangered, and proposed species that the USFWS has identified as potentially present in this area include bald eagle, Canada lynx, black-footed ferret, Ute-ladies= tresses, and mountain plover. Candidate species that USFWS has identified include black-tailed prairie dog, western boreal toad, yellow-billed cuckoo, and Arctic grayling.

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

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

The principal land use on the PSO tract is domestic grazing and wildlife habitat. Big game hunting is a principal recreational use in this area. Active mining would preclude other land uses. Recreational use of the PSO Tract would be severely limited during mining. However, there is little public surface included in the tract and P&M, the main surface estate owner, does not allow sport hunting on the PSO Tract. Within 10 years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels.

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

wells located adjacent to the mining activities.

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

No sites of Native American religious or cultural importance have been identified on the PSO Tract. The Northern Cheyenne Indian Reservation is located approximately 25 miles north of the PSO Tract, and the Crow Indian Reservation is located less than a mile northwest of the tract in Montana. An executive summary of the cultural resources identified on the PSO Tract has been sent to the Northern Cheyenne and the Crow tribes, as well as other tribes known to have an interest in the region. BLM will work with interested tribes to provide tours of the area and specific resources. If sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

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

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

Impacts from noise generated by mining activities on the PSO Tract are not expected to be significant, but nearby residences may be affected by the noises associated with mining the tract, including the proposed overland conveyor. The nearest occupied dwelling is approximately 1,300 ft from the PSO Tract. At that distance, the noise associated with blasting and mining would be below adverse levels.

The only new transportation facilities would be the overland conveyor and coal loadout facilities proposed south of the PSO Tract. P&M has proposed a location for these facilities, however, P&M would

have to negotiate access with the affected surface landowners prior to construction of the conveyor or coal loadout facilities. Any active pipelines and utility lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their removal or relocation.

The state and federal governments would not receive royalty or bonus payments for the coal if the exchange is completed. At a production rate of 10 million tons per year and a sale price of $8.00 per ton, the value of annual production at the Ash Creek Mine would be about $80 million. The mine would employ about 70 people. Sheridan County would see an increase in assessed valuation, property tax revenues, and sales and use tax revenue. The estimated total direct return to the State of Wyoming from the production of coal in the PSO Tract, in current dollars would be $99 million.

The opening of a surface coal mine would likely have adverse socioeconomic impacts on the adjacent landowners, who would be likely to experience depreciation in their property values as a result of their proximity to a surface coal mining operation and the associated facilities, noise, air quality emissions, traffic, etc.

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

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

Under the No Action Alternative, the Bridger, JO Ranch, and Welch lands would remain in private ownership, and could be developed by the private landowner. The mining-related impacts described in the preceding paragraphs to topography and physiology, geology and minerals, soils, air quality, water resources, AVFs, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would not occur on the PSO Tract.

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

Other projects that are in progress or planned in the Wyoming PRB include current and proposed CBM development; federal coal leasing in Campbell and Converse Counties; construction and operation of NAPG's Two Elk coal-fired power plant east of the Black Thunder Mine; construction and operation of Black Hills Corporations Wygen II coal-fired power plant near the Wyodak Mine east of Gillette, Wyoming; and construction and use of the proposed DM&E rail line across portions of Campbell, Converse, Niobrara, and Weston Counties. With the exception of CBM development, the impacts of completing and operating these projects would not be expected to overlap with the impacts of mining the PSO Tract because the other proposed projects would all be located in the eastern PRB.

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

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

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

These regional EISs projected development levels for coal, oil and gas, and other minerals in the PRB in 1990 and 1995. In general, the current actual mineral development levels are at or below the levels predicted in the regional EISs for 1990 and 1995. The 1981 EIS estimated that mines in the Sheridan area (Big Horn, Decker, and Spring Creek) would produce 23.7 million tons of coal per year in 1990 and 1995. Actual 1999 production from those mines was 22 million tons. The levels of production of natural gas are higher than projected in the regional EISs.

Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality, and wildlife are likely to occur.

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

A PRB air quality impact assessment was prepared by Argonne National Laboratory as part of the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a) and the Montana *Statewide Final EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans* (BLM 2003b) under the direction of the Wyoming and Montana BLM (Argonne 2002). This analysis was prepared to analyze the potential air quality impacts of the proposed CBM development in the PRB as well as other reasonably foreseeable emission sources in the basin. Coal mining is included as one of the other reasonably foreseeable

emission sources. Coal mining data supplied by BLM for the analysis included estimated coal production volume (based on coal demand forecasts), annual acreage disturbance, and approximate location of mining activity for active mines in Wyoming and Montana during a year of estimated maximum overlapping cumulative development in the basin.

Under the PRB Oil and Gas Project EIS Preferred Alternatives 2A and 1, this analysis predicted:

- Cumulative PM_{10} 24-hour near-field concentrations above the PSD Class II increment, cumulative near-field concentrations of other pollutants below increments;

- Cumulative NO_2 annual far-field concentrations above the PSD Class I increment in the Northern Cheyenne Reservation, cumulative NO_2 annual far-field concentrations below increments in other areas;

- Cumulative PM_{10} 24-hour far-field concentrations above the PSD Class I increment in the Northern Cheyenne Reservation and the Washakie Wilderness, cumulative PM_{10} 24-hour far-field concentrations below increments in other areas; and

- Cumulative visibility impacts in mandatory federal Class I areas ranging from 3 days to 32 days above 1 dV.

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

Wildlife habitat quality has declined in the PRB due to a continuing trend of landscape fragmentation from roads, rail lines, oil and gas wells, coal mines, and fences. Mining of the PSO Tract would add to this habitat fragmentation. A WGFD review of mine monitoring data in Wyoming for big game species concluded that the monitoring had demonstrated the lack of impacts to big game on existing mine sites. No severe mine-caused mortalities have occurred and no long-lasting impacts on big game have been noted on existing mine sites. Wildlife mitigation measures required by state and federal regulations include designing fences to permit wildlife passage, raptor proofing transmission poles, reducing vehicle speed limits to minimize mortality, and restoring topography and vegetation to benefit wildlife.

BLM prepared this EIS to evaluate the environmental impacts of completing this exchange in accordance with NEPA, as required under 43 CFR 2200.0-6(h). The BLM will use this analysis in making a public interest determination on whether to exchange coal for the offered lands as required under 43 CFR 2200.0-6(b). After completion of this final EIS, but prior to making a public interest determination and issuing a notice of decision, the BLM will schedule and hold a public meeting to receive public comments on the public interest factors of the proposed exchange, as required under 43 CFR 2203.3. Completion of these steps will meet the requirements under 43 CFR 2201.7(a), which state "Upon completion of all environmental analysis and appropriate documentation, appraisals, and all other supporting studies and requirements to determine if a proposed exchange is in the public interest and in compliance with applicable law and regulations, the authorized officer shall decide whether to approve an exchange proposal." If the exchange is completed and P&M acquires the federal coal in the PSO Tract, the tract cannot be mined until after a detailed surface mining and reclamation plan is submitted to and approved by WDEQ.

1.0 INTRODUCTION

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

P&M owns approximately 5,923 acres of surface estate and portions of the mineral estate on the lands shown in Figures 1-2, 1-3, and 1-4, which they are offering to exchange for federal coal rights of equal value in the tract shown in Figure 1-5. The location of these lands and minerals is described in more detail in Chapter 2.

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

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

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

Figure 1-5 shows the federal coal tract P&M seeks to acquire by exchange for the properties described above. It includes

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

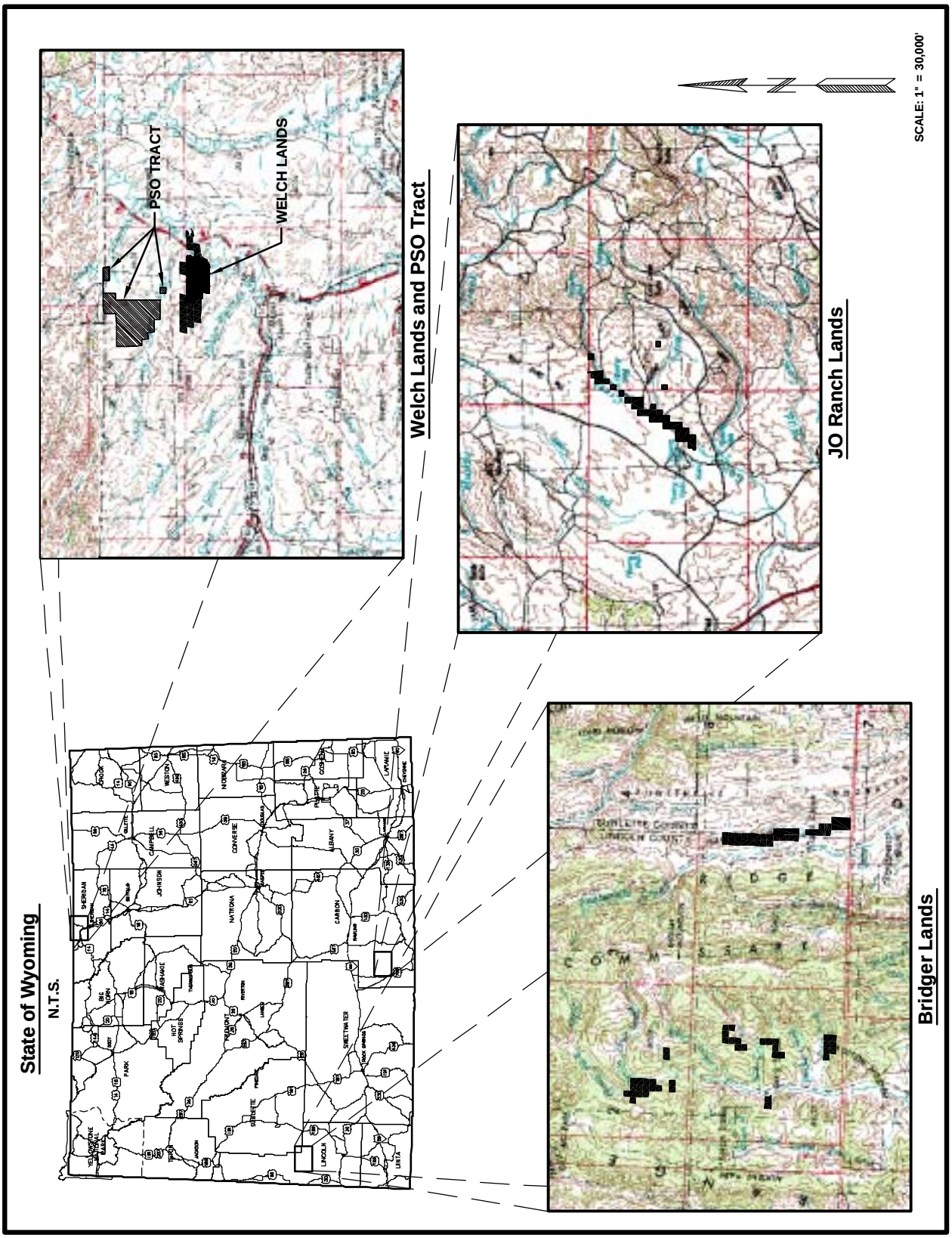


Figure 1-1. General Location of Lands Being Offered for Exchange by P&M and the PSO Tract.

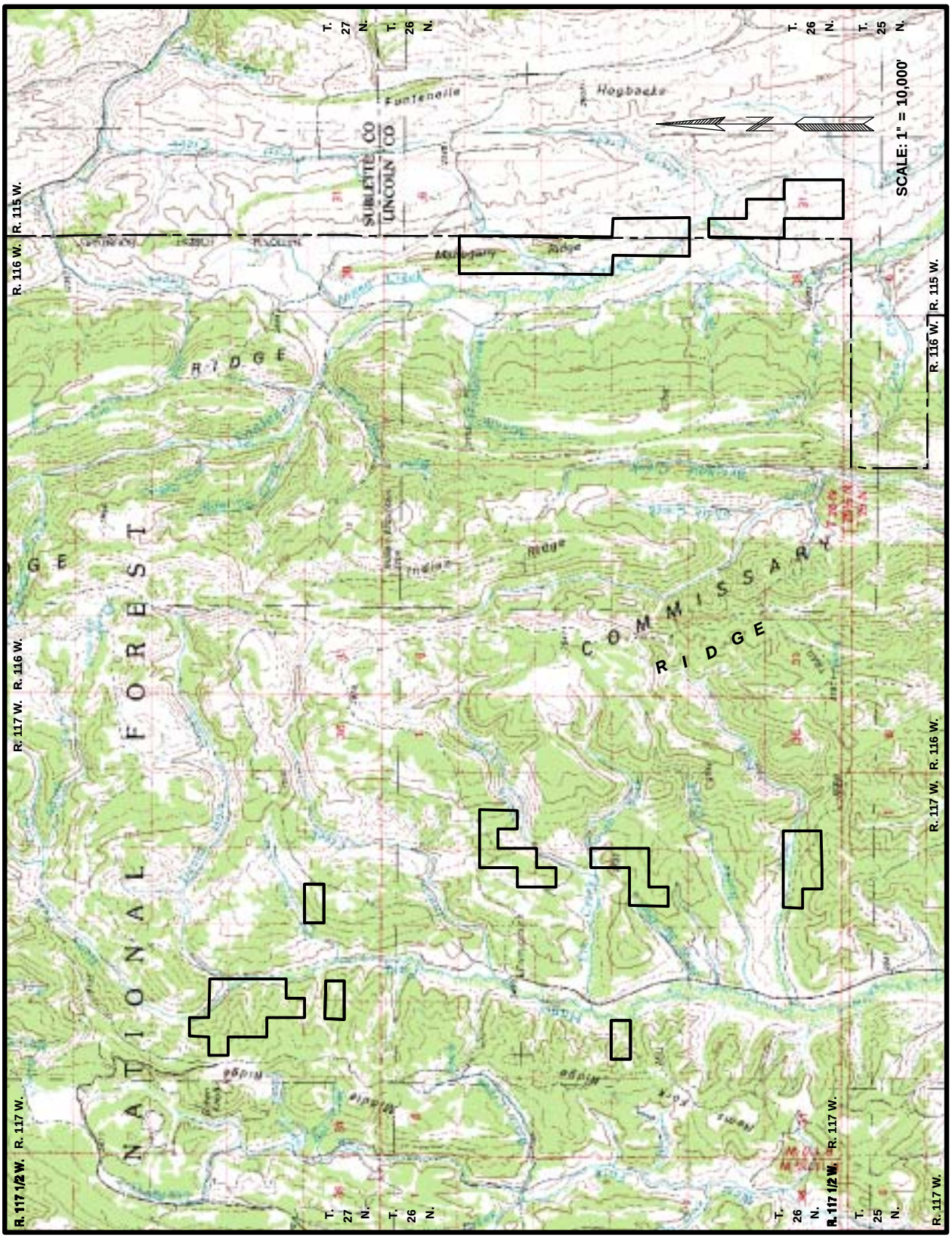


Figure 1-2. Bridger Lands Location Map.

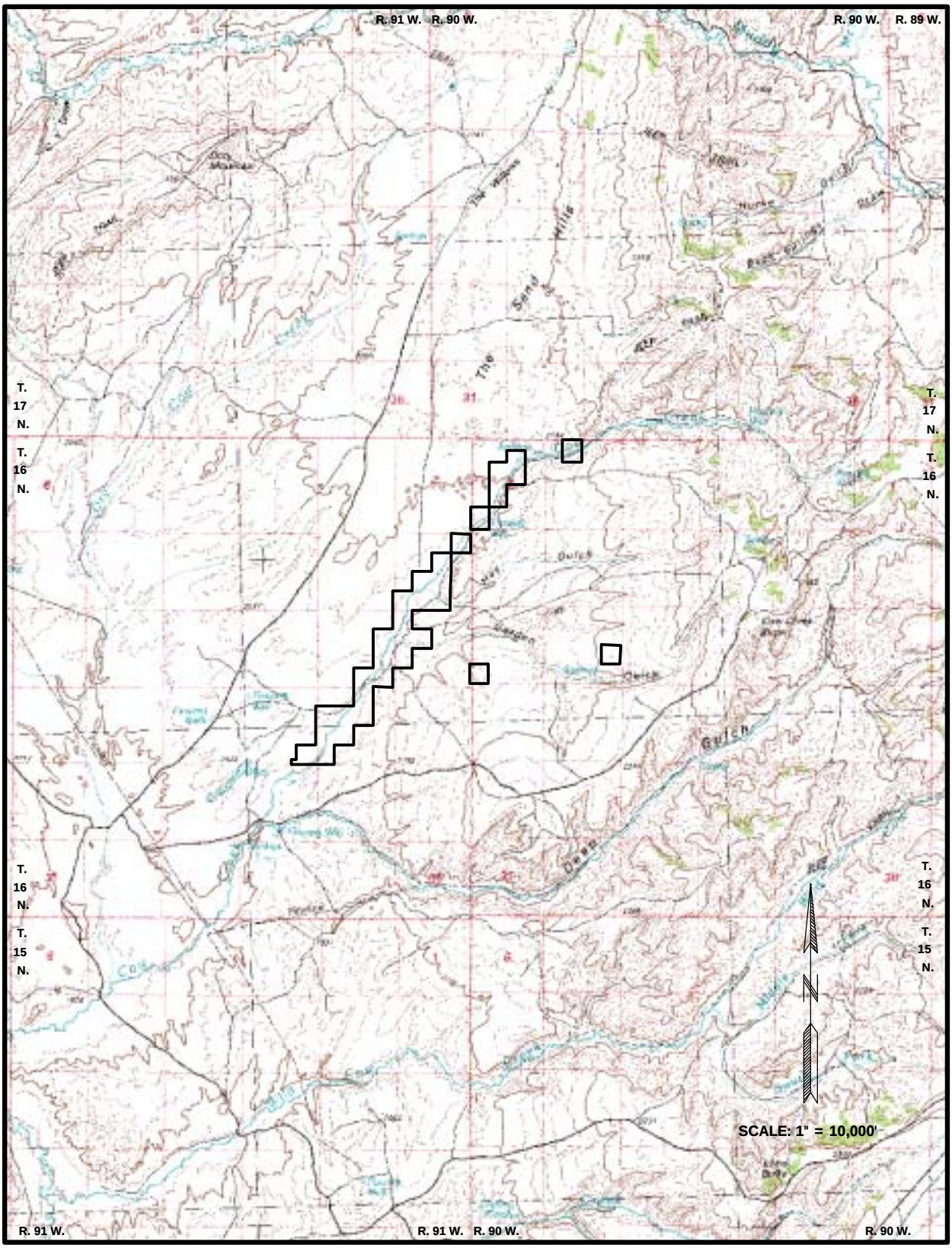


Figure 1-3. JO Ranch Lands Location Map.

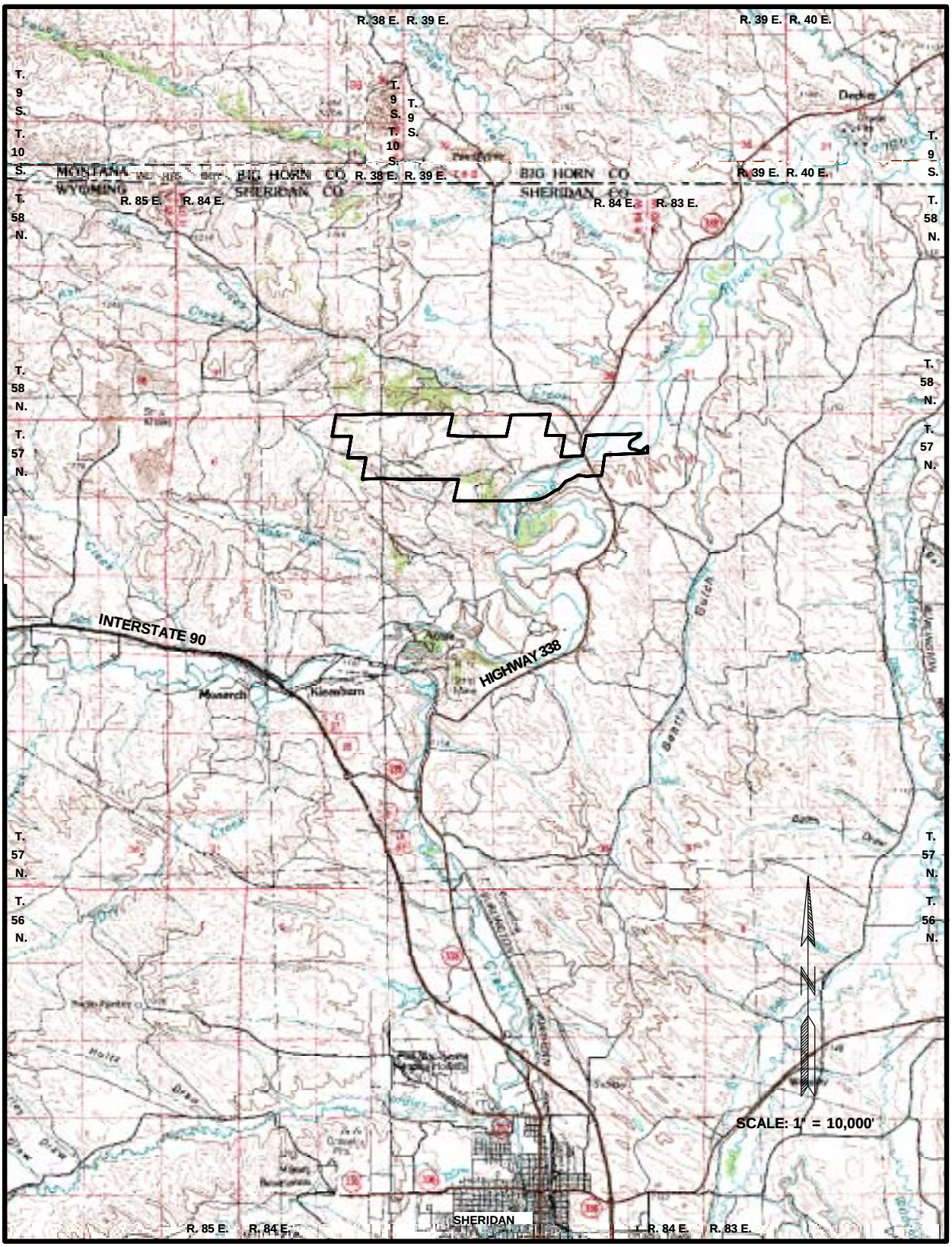


Figure 1-4. Welch Lands Location Map.

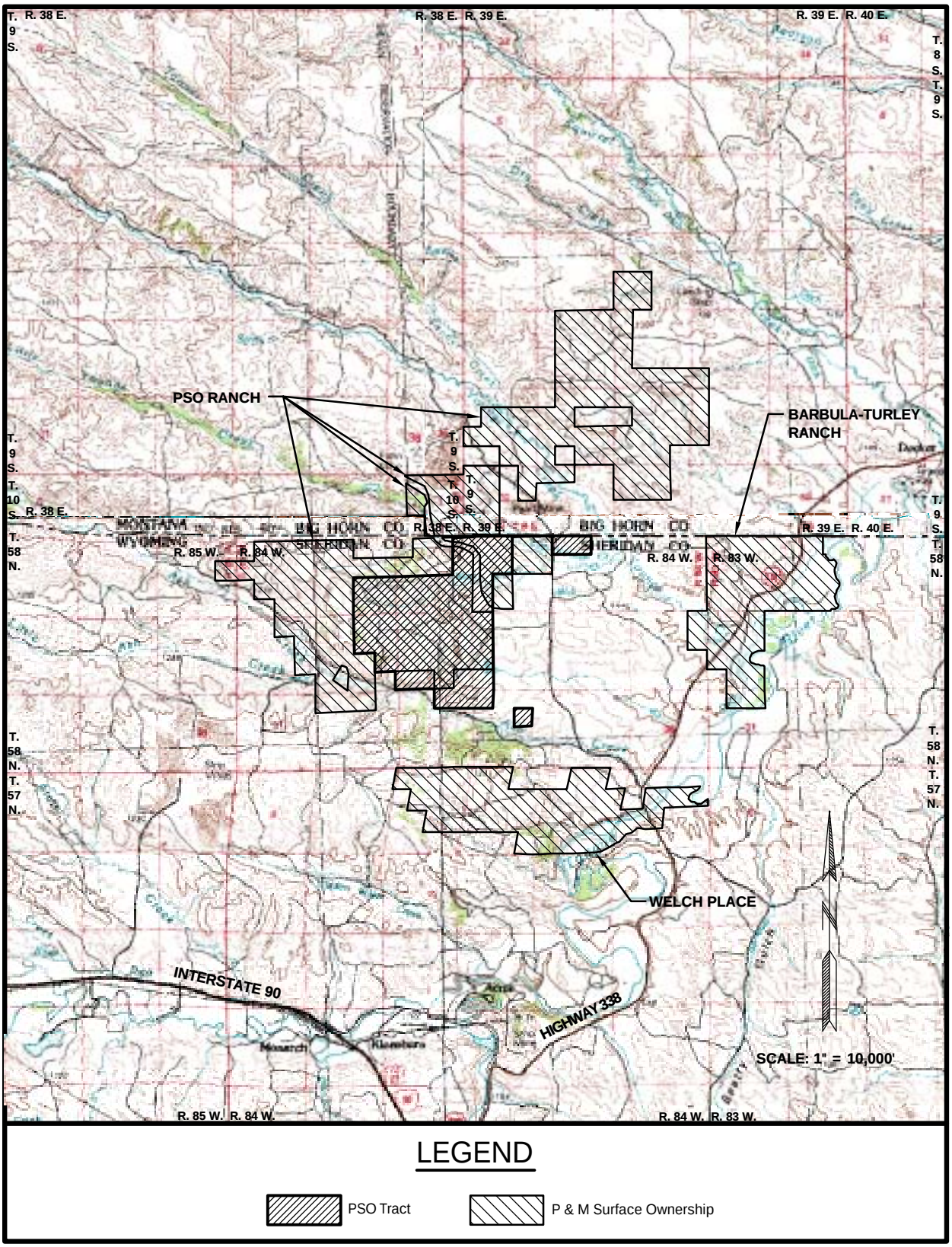


Figure 1-5. Location of P & M Surface Lands and PSO Tract.

approximately 2,045 acres of land referred to as the PSO Tract in this EIS. Figure 1-5 also shows the lands north of Sheridan, Wyoming where P&M owns the surface. P&M owns the surface of most, but not all, of the PSO Tract. There are 6.41 acres on public land in the tract, located in Section 15, T.58N., R.84W., and there are several other private surface owners with lands overlying some of the federal coal included in the PSO Tract (see discussion in Section 3.4.11 of this document). The coal beneath this tract is unleased federal coal, for which BLM is the managing agency. If an exchange is completed, BLM would transfer ownership of the coal to P&M.

The exchange is being processed under the provisions of Section 206 of FLPMA, the Federal Land Exchange Facilitation Act, Public Law No. 106-248, and the regulations at 43 CFR 2200. The exchange proposal was initially reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization. On October 31, 2000, the National Land Exchange Evaluation and Assistance Team concluded their technical review of the exchange proposal and concurred with BLM's request to proceed with processing the exchange. The PRRCT reviewed the exchange proposal at a public meeting held on October 27, 1999 in Gillette, Wyoming. The processing steps for land exchanges involving coal are included in Appendix A.

Land exchanges, which are discretionary, are important tools used to consolidate land ownership patterns while bringing important resources into public ownership. The two most important considerations in evaluating a land exchange proposal are (1) whether the public interest will be well served if the exchange is completed, as required under 43 CFR 2200.0-6(b); and (2) whether the value of the interests being acquired is of equal value to the lands or interests being conveyed to private ownership (as required under 43 CFR 2200.0-6(c)) or can be equalized in accordance with the methods described under 43 CFR 2201.6. The federal and non-federal lands involved in an exchange must also be located within the same state and the exchange must be in conformance with all applicable land use management plans or plan amendments.

In making a public interest determination, BLM must consider a number of factors, which are outlined in the regulations at 43 CFR 2200.0-6(b). These factors include the opportunity to achieve better management of federal lands, the opportunity to meet the needs of state and local residents and their economies, and the opportunity to secure important objectives, which include: protection of fish and wildlife habitats, cultural resources, watersheds, wilderness, and aesthetic values; enhancement of recreation opportunities and public access, consolidation of lands and/or interests in lands, such as mineral and timber interests, for more logical and efficient management and development; consolidation of split estate lands; expansion of communities;

accommodation of land use authorizations; promotion of multiple-use values; and fulfillment of public needs. A public interest determination must conclude that the resource values and public objectives that the federal lands or interests to be conveyed may serve, if retained in federal ownership, are not greater than the resource values and public objectives that the non-federal lands or interests may serve, if acquired by the federal government.

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

Under 43 CFR 2200.0-6(h), the BLM must also evaluate the environmental impacts of completing the exchange in accordance with the requirements of NEPA. BLM has determined that the requirements of NEPA would be best served by preparing an EIS. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of exchanging the federal coal which P&M proposes to acquire as well as to the site specific and cumulative impacts of U.S. acquisition of the lands and associated mineral resources offered for exchange by P&M. Although BLM would not authorize mining by exchanging the federal coal as proposed, this EIS considers the impacts of mining the coal proposed for exchange because P&M has indicated they will consider opening a surface coal mine on the PSO Tract, if the exchange proposal is approved and they acquire the coal. If the exchange is not completed as proposed, all or part of the federal coal in the PSO Tract could be leased and mined. The environmental impacts of mining the coal would be similar whether the coal is exchanged or leased.

BLM will consider the analysis in this EIS in making a public interest determination, in accordance with 43 CFR 2200.0-6(b), and in making a decision whether to approve this exchange proposal, in accordance with 43 CFR 2201.7-1.

The value of the federal coal that is included in the exchange must be equal to the value of the P&M properties at the time the exchange is approved. Due to the fact that the values of both the federal coal and the surface lands have changed since this exchange was proposed and are continuing to change with time, the amount of federal coal that will be offered in exchange for the P&M lands will be determined after completion of this environmental analysis and prior to a Notice of Decision as required under 43 CFR

2201.7-1. At the time the decision is signed, BLM will enter into a binding exchange agreement.

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

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

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

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

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

1.1 Purpose and Need for Action

P&M, the proponent of this exchange, wishes to acquire all or part of the federal coal beneath the PSO Tract in northern Sheridan County, Wyoming, with the intent of eventually opening a surface mine. In exchange, the federal government would acquire all or part of the surface and mineral estate that P&M owns in the properties being offered (Bridger, JO Ranch, and Welch lands, shown in Figures 1-2, 1-3, and 1-4, respectively). The amount of federal coal that P&M would acquire and the amount of private land and minerals that the federal government would receive would be determined by the value of the federal coal and the P&M properties at the time of the exchange.

BLM and USFS are considering the exchange because the lands P&M is offering have significant public resource values. The Bridger lands (Figure 1-2) are the largest in-holdings of private lands within the Kemmerer Ranger District of the BTNF. The lands are currently used for grazing, wildlife habitat, recreation, and timber production. These uses are consistent with the *Bridger-Teton National Forest Land and Resource Management Plan* (USFS 1990). While these lands remain in private ownership, there is a possibility that they could be

subdivided and/or developed, which would not be in conformance with the USFS *Bridger-Teton National Forest Land and Resource Management Plan*. If the lands are acquired and become public lands, they would be managed with the surrounding USFS lands in this area. It is a high priority of the USFS to acquire in-holdings within the BTNF boundary.

The Bridger lands located outside the BTNF (Figure 1-2) are surrounded by public lands managed by BLM and the USFS. These lands are situated along Fontenelle and Perkins Creeks, and contain important riparian habitat. These lands are currently used for livestock grazing and wildlife habitat. If the lands are acquired, they will be incorporated into the existing multiple use management consistent with the other surrounding BLM lands in accordance with the BLM *Pinedale Resource Management Plan* (BLM 1988a).

The JO Ranch lands (Figure 1-3) are private in-holdings completely surrounded by public lands managed by BLM. These lands are situated along Cow Creek and contain several miles of important riparian habitat within the administrative boundaries of the BLM Rawlins Field Office. These lands are currently used for livestock grazing and wildlife habitat, consistent with the typical uses of the surrounding BLM lands. If the lands are acquired, they will be managed with the other public lands in accordance with the BLM *Great Divide Resource Management Plan* (BLM 1990).

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

As described in Section 1.0, P&M owns all of the surface estate included in these three properties offered for exchange, but owns varying portions of the mineral estate in the lands offered for exchange. In exchange for these lands and minerals, P&M would acquire ownership of an equal value of federal coal beneath the PSO Tract, shown in Figure 1-5. For the purposes of this analysis, it is assumed that all the federal coal identified by P&M for acquisition would be exchanged, but the amount of coal actually offered for exchange would depend upon final appraisals of all the properties. As stated previously, if an exchange is completed, P&M proposes to mine the coal they acquire, subject to approval of the mining and reclamation plan as required by SMCRA and Wyoming State law and regulations. No disturbance of the properties that would be acquired by

the U.S. government is proposed if the exchange is completed.

1.2 Regulatory Authority and Responsibility

BLM processes land exchanges under the authority provided by Section 206 of FLPMA as amended. A land exchange is a real estate transaction where the disposal of and acquisition of lands are combined in the same transaction. This exchange will be processed under the regulations at 43 CFR 2200, the 1988 Federal Land Exchange Facilitation Act, BLM Manual H-2200-1 (Land Exchange Handbook, BLM 1997), and existing BLM policy. BLM considered Public Law No. 106-248 (the 2000 Federal Land Transaction Facilitation Act) in evaluating this exchange, but determined that the exchange does not meet the criteria for processing under this act.

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

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

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

If an exchange is completed and ownership of the coal is transferred to P&M, the company would be required to submit a detailed permit application package to WDEQ before the coal could be mined.

WDEQ/LQD reviews the permit application package to insure the permit application complies with the permitting requirements and the coal mining operation will meet the performance standards of the approved Wyoming program. If the permit application package does comply, WDEQ issues the applicant a permit to conduct coal mining operations.

WDEQ enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement.

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

1.3 Relationship to BLM Policies, Plans, and Programs

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

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

1.4 Conformance with Existing Land Use Plans

FLPMA requires that lands considered for exchange be included in a comprehensive land use plan and that decisions to exchange the coal be compatible with that plan.

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

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

The JO Ranch lands are located in the area managed by the BLM Rawlins Field Office where

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

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

When BLM is evaluating leasing federal coal, four land use planning screens must be applied to determine whether the subject coal is acceptable for consideration for leasing. The four coal screens are:

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

In the case of this exchange, the PSO Tract is evaluated with respect to the four coal screens in the following discussion because P&M is proposing to open a surface coal mine if the exchange is completed. The Bridger lands, JO Ranch lands, and Welch lands are not evaluated with respect to the four coal screens in this EIS because surface coal mining is not proposed for these lands if the exchange is completed. Development potential of the coal lands, multiple land use decisions that eliminate federal coal deposits from consideration for leasing, and surface owner consultation are not directly applicable in the case of an exchange of federal coal because the coal would not remain under federal ownership if the exchange is completed. The unsuitability criteria apply to both federal and non-federal coal reserves under Section 522(b) of SMCRA. The presence of some of the resources included in these criteria may prevent mining of both federal and non-federal coal. In that event, the federal coal lessee or the private coal owner would be entitled to an exchange for the coal that they cannot mine. BLM does not want to exchange coal that cannot be mined due to federal restrictions because P&M could be entitled to another exchange in the future. Therefore, the unsuitability criteria need to be considered in selecting the coal that should be included in the PSO Tract, if the exchange proposal is approved.

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

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

Portions of the PSO Tract totaling about 520 acres were found to be unsuitable for coal leasing and development under Criterion 14 (Habitat for Migratory Birds) when the unsuitability criteria were applied in the early 1980s. The designation was applied due to the presence of important breeding habitat for the Lewis' woodpecker. This species is known to breed in the ponderosa pine habitat in the area of Ash Creek. BLM has reviewed this unsuitability finding and determined that Lewis' woodpeckers have been dropped from the list of "Migratory Non-Game Birds of Management Concern in the U.S." BLM advised USFWS of their intent to remove the unsuitability designation for Lewis' woodpecker habitat under Criterion 14 within this area and to complete a land use plan maintenance action to reflect this. In a letter dated August 20, 2001, USFWS indicated their willingness to concur with the proposed change in unsuitability designation for Criterion 14 and acknowledged that this species has been found to be more widely distributed in Wyoming than when the original designation of unsuitability was applied. The Lewis' woodpecker is not listed within the 2002 USFWS "Migratory Bird Species of Management Concern in Wyoming, Coal Mine List" (USFWS 2002a). However, USFWS requested that BLM consider removing the scoria hillsides on the western edge of the exchange area (which contains primary breeding habitat for the woodpecker) from the PSO Tract, if the exchange proposal is approved. If those areas remain in the exchange tract, the USFWS will require monitoring of the Lewis' woodpecker as part of their mining permit (USFWS 2001).

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

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

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

1.5 Consultation and Coordination

Initial Involvement

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

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

The BLM published the Notice of Exchange Proposal for four consecutive weeks, as required by the regulations at 43 CFR 2201.2(a) in the following newspapers:

- Rawlins Daily Times - December 22, 28, 2000, January 4, 11, 2001;
- The Kemmerer Gazette - December 21, 28, 2000, January 4, 11, 2001;
- The Daily Rocket-Miner - December 21, 28, 2000, January 4, 11, 2001;
- The Sheridan Press - December 21, 28, 2000, January 4, 11, 2001.

The BLM filed a Notice of Intent to Prepare an EIS and a Notice of Scoping in the *Federal Register* on February 14, 2001. The filing served as notice that the P&M exchange proposal had been received and public comment was requested. Public scoping meetings were held on March 5, 2001 in La Barge, Wyoming, March 6, 2001 in Rawlins, Wyoming and March 7, 2001 in Sheridan, Wyoming. At the

public meetings P&M, BLM, and USFS personnel orally presented information about the exchange process and the properties proposed for exchange. The presentations were followed by a question and answer period, during which oral comments were made. The scoping period extended from February 14 through March 31, 2001, during which time BLM received 23 written comments.

Chapter 5.0 provides a list of other federal, state, and local governmental agencies that were consulted in preparation of this EIS (Table 5-1) and the distribution list for this EIS (Table 5-3).

Issues and Concerns

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

Issues and concerns are summarized as follows:

- mineral ownership of acquired lands and whether these lands would be available for mineral development;
- fate of existing timber roads;
- grazing rights on the acquired lands;
- effect on county tax base if these lands change from private to public ownership;
- question of who underwrites the expense of the exchange;
- ownership and use of the water rights on the JO Ranch lands;
- fate of the buildings on the JO Ranch lands;
- potential conflicts with oil and gas development on the PSO Tract;
- access to the proposed mine on the PSO Tract and facilities to ship coal out;
- post-mine land uses on the PSO Tract;
- effects of blasting on nearest residents to the PSO Tract;
- effects of mining on air quality;
- expected revenues from the mining operation;
- public access to Welch lands;
- cumulative impacts of mineral development to other resources (e.g., groundwater, surface water, etc.);
- potential impacts on cultural and paleontological resources;
- potential impacts on T&E species and Migratory Birds of Management Concern in Wyoming;
- need for the exchange;
- reasonable alternatives to the exchange;
- encumbrances on the lands being exchanged;
- underground coal fire on the Welch lands; and
- wetland impacts.

Draft EIS

Parties on the distribution list were sent copies of the Draft EIS, and copies were made available for review at the BLM offices in Casper, Rawlins, Buffalo, Pinedale, and Cheyenne, and the USFS office in Kemmerer. A Notice of Availability was published in the *Federal Register* on May 24, 2002. A 60-day comment period on the Draft EIS commenced with the publication of the EPA Notice of Availability and ended on July 23, 2002. BLM received 21 comment letters on the Draft EIS.

Final EIS

All comments received on the Draft EIS are included, with agency responses, in this Final EIS, which is being sent to the parties on the distribution list. Availability of the Final EIS will be published in the *Federal Register*. A notice announcing the date, time, and location of a public meeting to receive public comments on the public interest factors of the proposed exchange, as required by 43 CFR 2203.3 will also be published. There will be a 30-day availability period for the Final EIS.

Department of Justice Consultation

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

Record of Decision (ROD)

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

Prior to preparation of the ROD, the final appraisals will be completed and independently reviewed. BLM will request the concurrence of the Department of the Interior Solicitor and the Department of Agriculture General Counsel on the ROD and the Notice of Availability of the ROD. Once the Solicitor's and General Counsel's concurrences are received, the BLM Wyoming State Director will request the concurrence of the BLM Washington Office through the BLM and USFS National Land Exchange Evaluation and Assistance Teams.

The decision to approve or disapprove the exchange will be mailed to parties on the mailing list and others who commented on this exchange during the exchange process. The BLM decision may be

protested within 45 days after publication of a notice of the availability of a decision to approve or disapprove an exchange proposal. The right of appeal from a protest decision may be pursued in accordance with 43 CFR part 4. The transfer of deeds and other administrative procedures to complete the exchange will follow.

2.0 PROPOSED ACTION AND ALTERNATIVES

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

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

Other alternatives considered but not analyzed in detail include:

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

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

2.1 Proposed Action

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

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

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

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

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

Lands to be administered by BLM:
T.26N., R.115W., 6th P.M., Wyoming
Tracts 49, 57, and 71.

Total: 638.37 acres more or less.

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

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

T.27N., R.117W., 6th P.M., Wyoming
Tracts 37 through 42.

Total: 2,447.88 acres more or less.

Minerals to be administered by BLM:
T.26N., R.115W., 6th P.M., Wyoming
Tracts 49, 57, and 71.

Total: 638.37 acres more or less.

Minerals included in tracts in area to be administered by USFS:
T.26N., R.116W., 6th P.M., Wyoming
Tracts 39, 41, and 42;

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

T.27N., R.117W., 6th P.M., Wyoming
Tracts 37 through 42.

Total: 2,447.88 acres more or less.

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

JO Ranch Lands
Carbon County, Wyoming

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

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

T.16N., R.91W., 6th P.M., Wyoming
Section 12: NE¼NE¼, SW¼NE¼, SW¼SW¼, E½SW¼, W½SE¼;
Section 13: W½NW¼, SE¼NW¼, NW¼SW¼;
Section 14: SE¼NE¼, NE¼SE¼, S½SE¼;
Section 22: SE¼SE¼, SE¼SE¼SW¼SE¼;
Section 23: W½NE¼, S½NW¼, N½SW¼, SW¼SW¼.

Total: 1,233.55 acres more or less.

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

The JO Ranch lands are surrounded by public lands and minerals

administered by the BLM. Under the Proposed Action, if these lands become public lands, future management of the acquired surface estate will be determined through additional NEPA analyses and planning decisions.

Welch Lands
Sheridan County, Wyoming

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

Lands
T.57N., R.84W., 6th P.M., Wyoming
Section 1: S½NE¼*, SE¼NW¼, N½SW¼*, SW¼SW¼*;
Section 2: Lots 2, 3, S½N½, S½**;
Section 3: Lots 3,4, S½N½, N½S½, SE¼SE¼;
Section 4: Lots 1 through 4, S½NE¼, SE¼NW¼, N½SE¼.

*T.57N., R.84W., Section 1:
- S½NE¼, there is a metes and bounds exclusion area of 25.51 acres.
- N½SW¼, there is a metes and bounds exclusion area of 1.2 acres.
- SW¼SW¼, there is a metes and bounds exclusion area of 10.6 acres.

**T.57N., R.84W., Section 2:
- S½, there is a metes and bounds exclusion area of 5.6 acres.

Total: 1,538.70 acres more or less.

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

T.57N., R.84W., 6th P.M., Wyoming
Section 1: S½NE¼ (excluding 25.51 acres), SE¼NW¼, N½SW¼ (excluding 1.2 acres);
Section 2: S½NW¼, S½ (excluding 5.6 acres);
Section 3: S½NE¼, SE¼NW¼, N½SE¼, SE¼SE¼.

Total: 807.69 acres more or less.

The remaining 731.01 acres of coal estate in the Welch lands are federally owned. P&M does not own and is not offering to exchange any non-coal mineral rights underlying the Welch lands.

The Welch lands are surrounded by private lands and private and federal minerals. The federal minerals are administered by the BLM Buffalo Field Office.

Public concern has been expressed over BLM acquisition of an underground coal seam fire on the Welch lands. BLM is evaluating several tract configuration options for the Welch lands that the federal government would acquire, if the exchange is completed. The underground coal seam fire occupies approximately 13 acres in the SW¼ of Section 2, T.57N.,

R.84W. The options BLM is considering include:

- acquiring all of the offered lands in the Welch lands tract;
- deleting the E½SW¼SW¼ and the W½SE¼SW¼ of Section 2, T.57N., R.84W. (40 acres), which contains the active fire area, from the Welch lands tract;
- deleting the SW¼SW¼ and the W½SE¼SW¼ of Section 2 and the SE¼SE¼ of Section 3, T.57N., R.84W. (100 acres), which includes the active fire area and the previously mined lands, from the Welch lands tract; and
- deleting the S½NW¼SW¼, SW¼SW¼, S½NE¼SW¼, and SE¼SW¼ of Section 2, and the SE¼NE¼SW¼, S½NW¼SE¼, SE¼SE¼, and S½NE¼SE¼ of Section 3, T.57N., R.84W. (210 acres), which includes the active fire, the mined lands, and a buffer zone from the Welch lands tract.

Further discussion of the underground coal seam fire and the area that BLM is considering removing from the Welch lands tract under these options can be found in the BLM technical report on the underground coal seam fire, which is included as Appendix D of this document. BLM's preferred option is to acquire all of the Welch lands.

If the Welch lands are acquired, the BLM Buffalo Field Office would determine future management of these lands, including the area occupied by the underground coal seam fire, through additional NEPA analyses and planning decisions.

PSO Tract
Sheridan County, Wyoming

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

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

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

Total: 2,045.53 acres more or less.

The land description and acreage are based on the BLM Status of Public Domain Land and Mineral Title approved Coal Plat as of November 12, 1999. BLM was considering a thorough field investigation and conditional corrective resurvey in T.58N., R.84W., after receiving information from a private surveyor in 2001 that there were discrepancies between the 1952 BLM dependent resurvey and the original survey in this township. The corrective resurvey

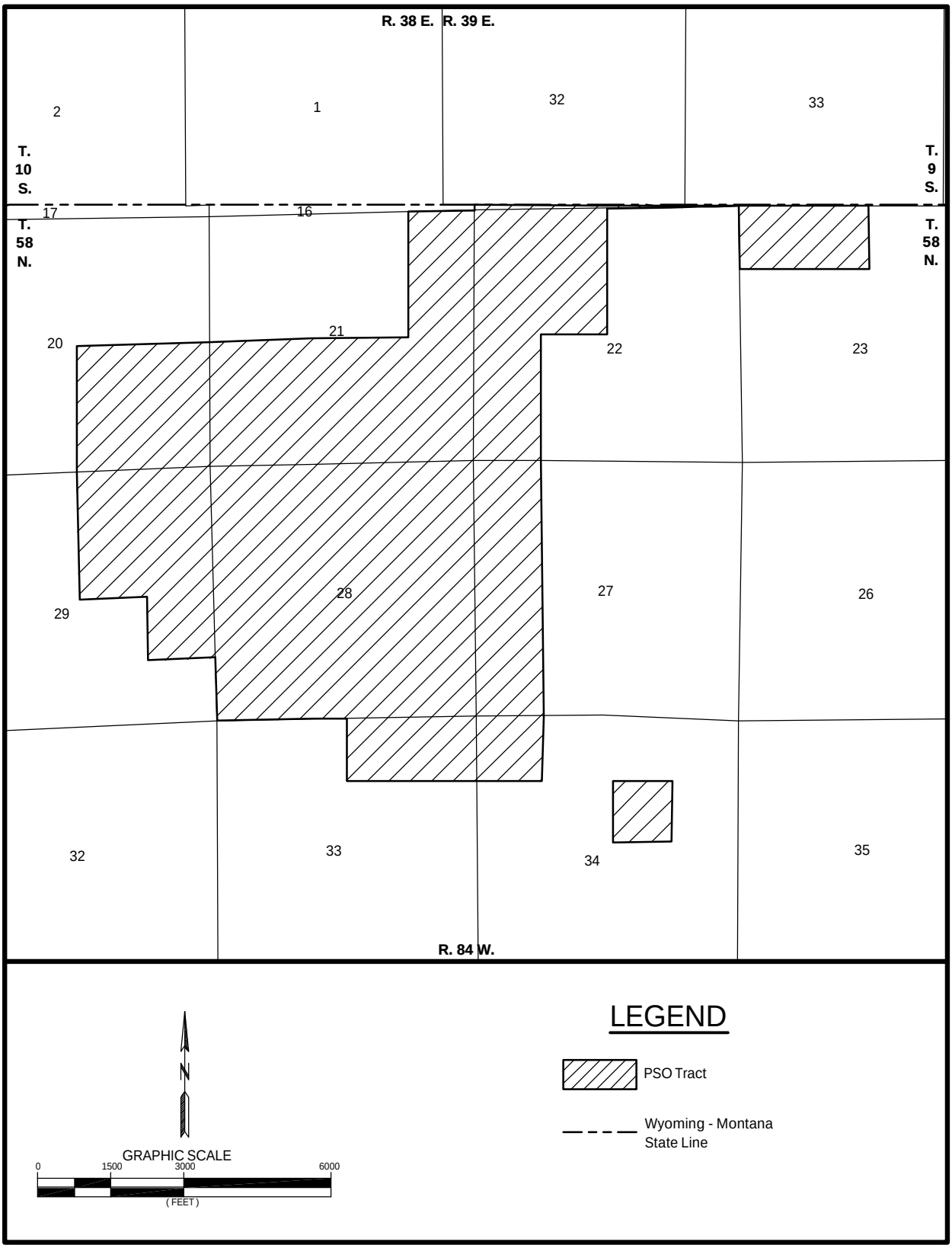


Figure 2-1. PSO Tract Configuration as Proposed.

area would have included the PSO Tract. This issue was resolved between BLM and the adjacent and the prospective coal estate owners, and a resurvey is not necessary to transfer title to the federal coal estate.

The Proposed Action assumes that the exchange will be completed and P&M will acquire and mine the federal coal included in the tract described above. For purposes of analyzing the potential impacts as required by NEPA, it is assumed that all the federal coal estate within the PSO Tract as proposed by P&M would be included in the exchange. BLM's preferred option at this time is to consider exchanging all of the federal coal estate included in the PSO Tract. The actual tract that would be offered for exchange would depend upon the appraised value of the coal and the P&M properties at the time the exchange is approved. If it is necessary to decrease the size of the PSO Tract in order to equalize the values of the properties to be exchanged, BLM will consider comments received from USFWS concerning removing the scoria hillsides on the western edge of the tract from the PSO Tract. USFWS has recommended removal of the scoria hillsides on the western edge of the PSO Tract from consideration for exchange due to the occurrence of primary breeding habitat for the Lewis' woodpecker on those hillsides.

If an exchange is completed, a detailed mining and reclamation plan would have to be developed and approved in accordance with SMCRA and Wyoming statutes before P&M could begin mining operations on the tract. In this case, if any operations in the detailed mining and reclamation plan would cross the state line (into Montana), those operations would also have to be developed and approved in accordance with Montana statutes. As part of the approval process, the mining and reclamation plan would undergo detailed review by state and federal agencies. The mining and reclamation plan would include monitoring and mitigation measures that are required by SMCRA, Wyoming statutes, and Montana statutes, if applicable. These monitoring and mitigation measures are considered to be part of the Proposed Action during the exchange process because they are regulatory requirements.

The final, detailed mining and reclamation plan, which must be approved prior to initiation of mining, could potentially differ from the conceptual plan used to analyze the impacts of the Proposed Action in this EIS. Figure 2-2 is a schematic mine plan, prepared by P&M, which is described below. In the schematic mine plan shown in Figure 2-2, P&M has included privately-owned coal, which lies outside of the PSO Tract and which is not included in the exchange proposal. P&M does not currently own this coal.

This conceptual mine plan does not propose to remove coal from the northern and western edges of the PSO Tract in the scoria hillside area that includes the potential Lewis' woodpecker habitat.

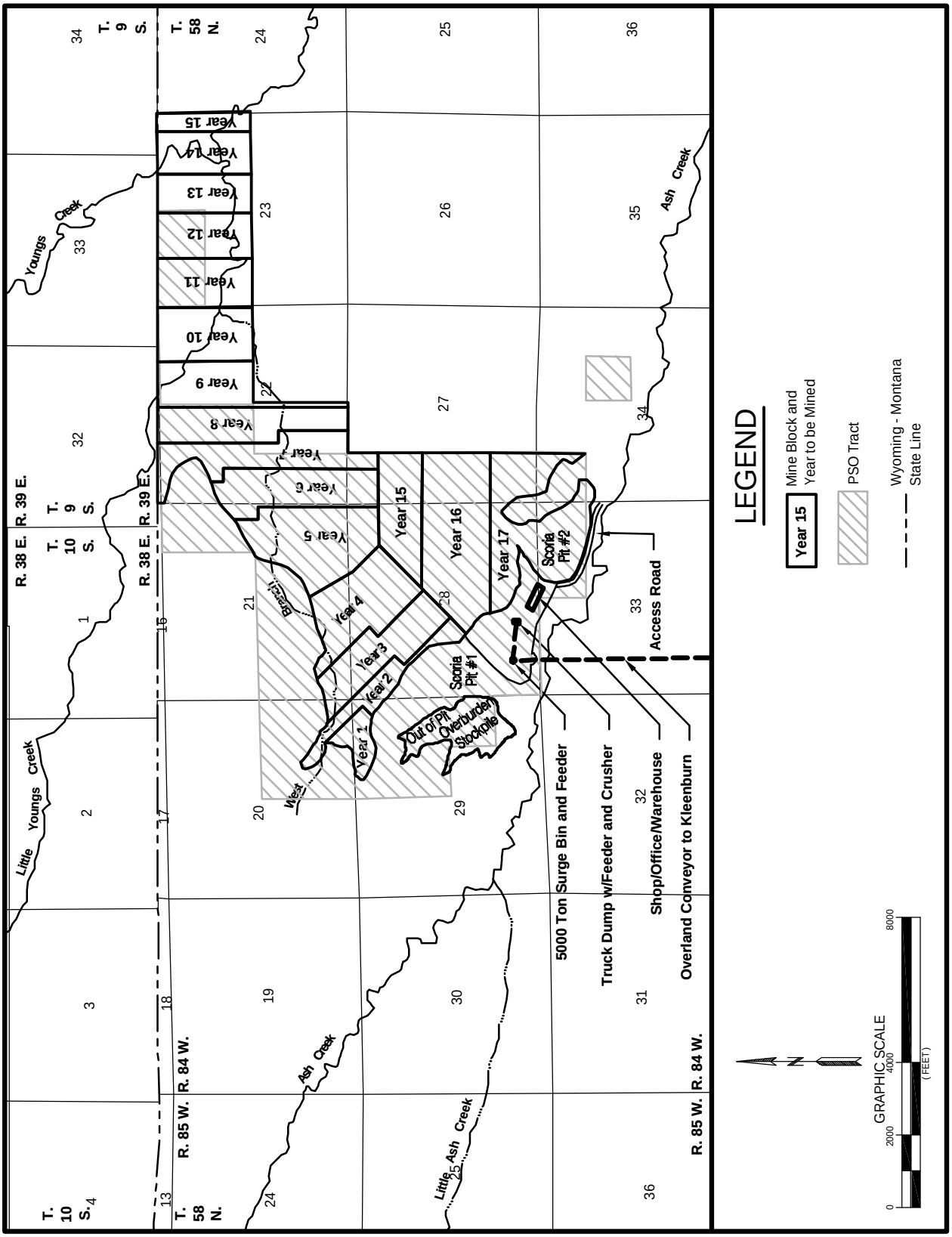


Figure 2-2. Schematic Mine Plan for the Ash Creek Mine.

There will probably be differences between the final, detailed mining and reclamation plan that P&M would be required to submit for approval prior to mining and P&M's proposed mine plan shown in Figure 2-2, but they would not be expected to significantly change most of the impacts described in this EIS. This is because major factors like tons of coal mined, yards of overburden removed, acres disturbed, etc. would not be significantly different from the plan used in this analysis.

Although the total area of the PSO Tract is about 2,045 acres, not all of this area contains coal that is economically recoverable under foreseeable conditions. Faulting, prehistoric natural coal fires, and other geologic factors have removed the coal or rendered it uneconomic to recover. P&M estimates that there are 153.2 million tons of mineable coal within the mine plan area, of which about 112.5 million tons are in the PSO Tract and are currently owned by the federal government. The total area to be mined under P&M's proposed mine plan is about 1,720 acres, of which 1,244 acres are on the PSO Tract. P&M assumes that about 95 percent of the mineable coal is recoverable, based on historical recovery factors at typical PRB surface coal mines. This would mean that 145.5 million tons, 107 million tons of which are on the PSO Tract and are now federally owned, would be recoverable over the life of the mine. An estimated total of 356.1 million bcy of overburden would be excavated.

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

The total estimated area of disturbance would be about 2,595 acres. The area of disturbance would exceed the area of coal removal due to incidental disturbances associated with mining the coal. These include topsoil buffer areas, scoria mining, grading to blend naturally with reclaimed contours, and surface facilities which could include shop/office/warehouse buildings, truck dump with crushing and feeding equipment, transfer conveyor, surge storage bin and feeder, a 24,000-ft long overland conveyor, rail loop and loadout facility, haul roads, and access road. The estimated 2,595-acre area of disturbance includes 99.5 acres for the proposed overland conveyor and 104.5 acres for the proposed rail loop and loadout facilities, which would be located outside of the general area of mine disturbance, under P&M's current mine proposal.

P&M proposes to utilize shovel and truck equipment similar to those commonly utilized in the industry at other PRB surface coal mines. Typical equipment sizes which could be used would include 240- to 320-ton trucks matched with 60- to 80-

ton capacity shovels. These primary equipment units would be used to remove overburden and interburden as well as mine coal. P&M prepared a mine plan layout, depicted schematically on Figure 2-2, to show how the coal within the proposed mine plan area could be recovered using this equipment and how it could be transported to the rail line for shipping. This is a conceptual mine plan layout prepared for purposes of evaluating the potential impacts of removing the coal. If the exchange is completed, P&M would have to acquire any needed rights-of–way and required construction permits before construction activities could begin, in addition to completing the mining and reclamation permit requirements. The location of the facilities could change based on a number of factors including costs, rights-of-way negotiations, and requirements imposed by the construction permits. P&M refers to the proposed mine as the Ash Creek Mine for planning purposes.

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

The proposed mining sequence would allow expansion into adjacent private coal reserves during the later part of the mine life, if P&M acquires the rights to mine that coal. This private coal is shown being mined in years seven through 15 of the schematic mine plan shown in Figure 2-2. Supporting equipment that would be utilized includes motor graders, crawler tractors, water trucks, scrapers, maintenance equipment, pumps, light plants, and related equipment common to the industry.

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

Facilities to be located at this site would include a maintenance shop, warehouse, employee bathhouse, and mine office complex as a single building unit. Equipment parking, employee and vendor parking, outside storage, and other improved site areas for fuel storage, equipment “lay-down”, and other

requirements of a surface coal mining operation would be provided within the facilities area.

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

P&M proposes to use an overland conveyor to transport coal to a unit train loadout facility on the BNSF mainline, which is located roughly 4.5 miles due south of the operation. An overland conveyor was selected to minimize disturbance at the site and reduce development costs while maximizing use of existing facilities located near the recently reclaimed Big Horn Coal Company loadout facilities. Using the most direct route between the proposed Ash Creek Mine facilities and the proposed loadout facilities, this conveyor would be approximately 24,000 ft long. The surface estate between the proposed mine and the loadout facilities is owned by private, government, and corporate entities. P&M would have to negotiate access with these surface owners and obtain the necessary construction permits prior to constructing the conveyor.

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

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

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

Grading of backfilled spoil would be completed to establish a postmining surface that would resemble the premining topography and would be approved by WDEQ/LQD. The postmining topography would be somewhat lower in elevation than the premining topography due to

Table 2-1. Production Schedule for the Proposed Ash Creek Mine.

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

coal removal. However, given the drainage configuration of the site, positive drainage could be established in the postmining topography with completion of reclamation activities.

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

P&M estimates that a selling price of $8.00 per ton would be needed to justify the expense of opening a new mine.

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

Hazardous and Solid Waste

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

Maintenance and lubrication of most of the equipment would take place at the shop facilities. Major lubrication, oil changes, etc., of most equipment would be performed

inside the service building lube bays, where used oil would be contained and deposited in storage tanks. The collected used oils would then be recycled offsite.

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

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

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

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

- Spill Prevention Control and Countermeasure Plans;
- Spill Response Plans;
- Inventories of Hazardous Chemical Categories pursuant to Section 313 of SARA, as amended; and
- Emergency Response Plans.

All mining operations are also required to be in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water

Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, and the Federal Clean Air Act. In addition, mining operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

2.2 Alternative 1

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

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

2.3 Alternatives Considered but not Analyzed in Detail

2.3.1 Alternative 2

Alternative 2, which is based on a comment received during the scoping process, assumes that the exchange does not take place and the government purchases the offered lands from P&M. This alternative assumes that P&M would be willing to sell the offered lands for the appraised value. P&M has stated that it is not offering and does not intend to sell its offered lands to the U.S. (BLM and USFS) at the appraised value being considered in the exchange. P&M has indicated that it would sell the lands on a competitive bid basis if the exchange is not completed. It might be possible to obtain an appropriation from the Land and Water Conservation Fund for purchase of some or all of the offered lands at the appraised value. This process would require several years and Congressional approval. Even if P&M was willing to delay holding a competitive sale until this process was completed, it is not likely that the U.S. would be able to competitively acquire all of these lands for the appraised value that might be approved through the Land and Water Conservation Fund. Therefore, this alternative was not analyzed in detail.

Under this alternative, the environmental impacts would be

similar to the Proposed Action for any of the Bridger, JO Ranch, and Welch lands that were successfully acquired by the U.S. The federal coal could potentially be leased and mined in the future, in which case the mining-related environmental impacts would be similar to the Proposed Action.

2.3.2 Alternative 3

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

Since decertification of the PRB as a coal producing region in 1989, BLM has leased 11 tracts of federal coal in the Wyoming PRB in response to applications for maintenance tracts to extend the lives of existing mines. BLM has not received an application to lease federal coal in the PSO Tract or in any other federal coal tract in the western part of the Wyoming PRB, where the PSO Tract is located.

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

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

2.4 Comparison of Alternatives

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

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

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

(i) the environmental impact of the Proposed Action,

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

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

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

	Proposed Action			No Action Alternative	
Tract	**Surface Estate (acres)**	**Mineral Estate (All Minerals) (acres)**	**Mineral Estate (Coal Only) (acres)**	**Surface Estate (acres)**	**Mineral Estate (acres)**
Bridger lands	3,086.25	3,086.25	0.00	0.00	0.00
JO Ranch lands	1,233.55	0.00	0.00	0.00	0.00
Welch lands	1,538.70	0.00	807.69	0.00	0.00
TOTAL	5,858.50	3,086.25	807.69	0.00	0.00

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

Item	**Proposed Action**	**No Action Alternative**
Mineable Federal Coal	112.5 million tons	none
Recoverable Federal Coal[1]	107.0 million tons	none
Area of Federal Coal Exchanged	2,045.53 acres	none
Area of Federal Coal to be Mined	1,244 acres	none
Total Area to be Disturbed by Coal Mining[2]	2,595 acres	none
Average Annual Coal Production	10 million tons	none
Average Number of Employees	70	none
Total Projected State Revenues[3]	$ 99.0 million	none
Total Projected Annual Revenues to Sheridan County[4]	$ 6.0 million	none
Total Projected Federal Revenues[5]	$ 53.0 million	none

1 Assumes 95 percent of mineable coal is recovered.
2 Includes disturbance due to mining, overburden stockpiling, construction of surface facilities, scoria mining, and related disturbance.
3 Projected revenue to State of Wyoming is $0.75 per ton of coal sold. Includes income from severance taxes, property and production taxes, sales and use taxes, and excludes Wyoming's share of federal royalty payments (UW 1994) (refer to Section 4.4.19 of this EIS), plus $0.35 per ton of coal sold for AML fees minus U.S. Government's 50 percent share.
4 Based on a coal price of $8.00 per ton and production rate of 10 million tons per year, including coal from PSO Tract and adjacent privately owned coal in mine plan area. Includes counties' share of severance taxes, property taxes, sales and use taxes.
5 Federal revenues are based on a coal price of $8.00 per ton u amount of recoverable coal u black lung tax of 4.0 percent, plus $0.35 per ton for AML fees u amount of recoverable coal minus the State's 50 percent share.
Note: All figures in this table are for the PSO Tract only.

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

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

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
	WELCH LANDS	
TOPOGRAPHY AND PHYSIOGRAPHY, GEOLOGY AND MINERALS, SOILS, AIR QUALITY, WATER RESOURCES, ALLUVIAL VALLEY FLOORS, WETLANDS, VEGETATION, WILDLIFE, THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES, CULTURAL RESOURCES, NATIVE AMERICAN CONCERNS, PALEONTOLOGICAL RESOURCES, VISUAL RESOURCES, NOISE, TRANSPORTATION FACILITIES	Negligible to moderate, beneficial, permanent on Welch lands. Lands would become public. BLM would manage surface resources in accordance with land use plans which would be amended to address management of these lands.	Nature, extent, and duration of impacts would depend on private landowner(s). Lands and minerals other than coal would remain private. Resources could be affected by any development conducted by private landowner(s).
LAND USE AND RECREATION	Moderate, beneficial, and adverse permanent on Welch lands. Public access would be provided. Existing uses could continue. Future management would be determined through additional NEPA and planning decisions. Private grazing leases would become federal grazing leases.	Nature, extent, and duration of impacts would depend on private landowner(s). Lands and minerals other than coal would remain private. Resources could be affected by any development conducted by landowner(s). Public access would be determined by private landowner(s). Status of grazing leases would not change.
	PSO TRACT	
TOPOGRAPHY & PHYSIOGRAPHY		
PERMANENT TOPOGRAPHIC MODERATION could result in:		
Microhabitat reduction	Moderate, long term on mine area	No impact due to mining
Habitat diversity reduction	Moderate, long term on mine area	No impact due to mining
Reduction in water runoff and peak flows	Moderate, beneficial, long term on mine area	No impact due to mining
Increased precipitation infiltration	Moderate, beneficial, long term on mine area	No impact due to mining
Wildlife carrying capacity reduction	Moderate long term on mine area	No impact due to mining
Reduction in erosion	Moderate, beneficial, long term on mine area	No impact due to mining
Enhanced vegetative productivity	Moderate, beneficial, long term on mine area	No impact due to mining
Potential acceleration of groundwater recharge	Moderate, beneficial, long term on mine area	No impact due to mining

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
GEOLOGY AND MINERALS		
SUBSURFACE changes would result in:		
Removal of coal	Moderate, permanent on mine area	No impact due to mining
Removal and replacement of topsoil and overburden	Moderate, permanent on mine area	No impact due to mining
Physical characteristic alterations in geology	Moderate, permanent on mine area	No impact due to mining
Loss of CBM through venting and/or drainage[3]	Moderate, permanent on mine area	No impact due to mining
Loss of access for sub-coal oil and gas development	Moderate, short term on mine area	No impact due to mining
SOILS		
CHANGES IN PHYSICAL PROPERTIES would include:		
Increased near-surface bulk density & decrease in soil infiltration rate	Moderate, long term on mine area	No impact due to mining
More uniformity in soil type, thickness, and texture	Moderate, beneficial, long term on mine area	No impact due to mining
Decreased soil loss due to topographic modification	Moderate, beneficial, long term on mine area	No impact due to mining
CHANGES IN CHEMICAL PROPERTIES would include:		
More uniform soil chemistry and nutrient distribution	Moderate, beneficial, long term on mine area	No impact due to mining
CHANGES IN BIOLOGICAL PROPERTIES would include:		
Organic matter reduction	Moderate, long term on mine area	No impact due to mining
Microorganism population reduction	Moderate, long term on mine area	No impact due to mining
Existing plant habitat reduction in soils stockpiled before placement	Moderate, long term on mine area	No impact due to mining
WATER RESOURCES		
SURFACE WATER		
CHANGES IN RUNOFF CHARACTERISTICS AND SEDIMENT DISCHARGE would include:		
Disruption of surface drainage systems	Moderate, short term on mine area	No impact due to mining
Increased runoff and erosion rates	Moderate, short term on mine area	No impact due to mining
Increased infiltration in sediment ponds		
Increases in frequency & amount of flows in Youngs Creek due to discharge from settling ponds	Moderate, short term on mine area	No impact due to mining
Increase in suspended solids in discharges downstream of mine area	Moderate, short term on mine area	No impact due to mining

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.
[3] Most of the CBM reserves could be recovered prior to initiation of mining activity. CBM reserves in the Dietz 3 coal bed that are not recovered prior to mining would be lost through venting. CBM reserves in the Monarch and Carney coal beds that are not recovered prior to mining could be lost through drainage or recovered after mining is completed.

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
WATER RESOURCES (continued)		
GROUNDWATER		
CHANGES ASSOCIATED WITH MINING OPERATIONS would include:		
Removal of coal and overburden aquifers	Negligible, short term on mine area	No impact due to mining
Replacement of existing coal and overburden with unconsolidated backfill material	Negligible, long term on mine area	No impact due to mining
Depressed water levels in aquifers within northeast-trending fault block occupied by PSO Tract	Moderate, short term within fault block	No impact due to mining
Change in hydraulic properties in backfilled areas	Negligible, long term on mine area	No impact due to mining
Change in groundwater quality in backfilled areas	Moderate, long term on mine area	No impact due to mining
Decrease in water supply for two groundwater-right holders within mine five-foot drawdown area	Moderate, short term	No impact due to mining
Disturbance of Youngs Creek/Little Youngs Creek alluvial aquifers if P&M acquires rights to mine private coal within PSO Tract	Moderate, short term	No impact due to mining
ALLUVIAL VALLEY FLOORS		
While a final determination has not been made by WDEQ/LQD, it is believed that proposed mining operations would not affect AVFs significant to agriculture	No impact to AVFs significant to agriculture on proposed mine area. AVFs determined not to be significant to agriculture would be restored if affected.	No impact due to mining
WETLANDS		
Removal of existing jurisdictional wetlands by mining operations	Jurisdictional wetlands on disturbance areas would be destroyed and replaced in accordance with Section 404 of the Clean Water Act	No impact due to mining
Removal of existing non-jurisdictional wetlands by mining operations	Non-jurisdictional wetlands on disturbance areas would be destroyed and replaced in accordance with agreements with surface owners or surface managing agency.	No impact due to mining
VEGETATION		
REMOVAL OF NATIVE VEGETATION would result in:		
Increased erosion	Moderate, short term on mine area	No impact due to mining
Wildlife and livestock habitat loss	Moderate, short term on mine area	No impact due to mining

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
VEGETATION (continued)		
AFTER RECLAMATION the following could result:		
Impact in vegetation patterns	Negligible, long term on mine area	No impact due to mining
Reduction in vegetation diversity	Negligible, long term on mine area	No impact due to mining
Reduction in shrub density	Moderate, long term on mine area	No impact due to mining
Decrease in big game habitat carrying capacity	Moderate, long term on mine area	No impact due to mining
WILDLIFE		
DURING MINING the following could occur:		
Wildlife displacement and increased competition on habitat outside of mining area	Moderate, short term on mine area	No impact due to mining
Restrictions on wildlife movement, particularly big game	Moderate, short term on mine area	No impact due to mining
Direct loss of small mammals	Moderate, short term on mine area	No impact due to mining
Loss of sage grouse nesting habitat and disturbance of breeding activities	Negligible, short term on mine area	No impact due to mining
Abandonment of raptor nests	Negligible, short term on mine area	No impact due to mining
Foraging habitat reduction for raptors	Negligible, short term on mine area	No impact due to mining
Loss of nesting and foraging habitat for Migratory Birds of Management Concern	Negligible, short term on mine area	No impact due to mining
Reduction in waterfowl and shorebird resting and feeding habitat	Negligible, short term on mine area	No impact due to mining
Loss of songbird nesting and foraging habitat	Moderate, short term on mine area	No impact due to mining
Temporary wildlife habitat loss	Negligible, short term on mine area	No impact due to mining'
Road kills by mine-related traffic	Negligible, short term on mine area	No impact due to mining
Reduction in big game carrying capacity and diversity	Moderate, long term on mine area	No impact due to mining
Disturbance of fish habitat in Little Youngs and Youngs Creeks	Negligible, short term on mine area	No impact due to mining

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES (See Appendix E for additional information)		
MINING could result in:		
Loss of bald eagle foraging habitat, increased potential for road kills of foraging eagle	Short term, may affect, not likely to adversely affect	No effect due to mining
Loss of limited potential Canada lynx habitat	Short term; may affect, not likely to adversely affect	No effect due to mining
Loss of limited potential Ute ladies'-tresses habitat	Short term; may affect, not likely to adversely affect	No effect due to mining
Loss of potential black-footed ferret habitat	Short term; may affect, not likely to adversely affect	No effect due to mining
Loss of potential mountain plover habitat	Short term; may affect, not likely to jeopardize	No effect due to mining
Loss of black-tailed prairie dog colonies and habitat	Short term; colonies and habitat within mine disturbance area would be destroyed	No effect due to mining
Loss of western boreal toad habitat	No effect on mine area	No effect due to mining
Loss of yellow-billed cuckoo habitat	No effect on mine area	No effect due to mining
Loss of Arctic grayling habitat	No effect on mine area	No effect due to mining
LAND USE AND RECREATION		
CONSEQUENCES OF MINING ON LAND USE would be:		
Reduction of livestock grazing	Moderate, short term on mine area	No impact due to mining
Loss of wildlife habitat	Moderate, short term on mine area	No impact due to mining
Loss of access for subcoal oil and gas development	Moderate, short term on mine area	No impact due to mining
Loss of potential public access to 6.41 acres of public land	Negligible, short term on mine area	No impact due to mining
Loss of CBM reserves through venting or drainage[3]	Moderate, permanent on mine area	No impact due to mining
Disruption of adjacent landowner activities	Moderate, short term	No impact due to mining
NATIVE AMERICAN CONCERNS	No impact identified on mine area	No impact due to mining
PALEONTOLOGICAL RESOURCES		
Overburden removal could expose fossils for scientific examination	Negligible on mine area	No impact due to mining

[1] Refer to Sections 4.0 through 4.5 for a discussion on magnitude of impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.
[3] Most of the CBM reserves could be recovered prior to initiation of mining activity. CBM reserves in the Dietz 3 coal bed that are not recovered prior to mining would be lost through venting. CBM reserves in the Monarch and Carney coal beds that are not recovered prior to mining could be lost through drainage or recovered after mining is completed.

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
VISUAL RESOURCES		
EVIDENT IMPACTS DURING MINING would include:		
Alteration of landscape classified by the BLM as VRM Class II	Negligible, short term on mine area	No impact due to mining
Partial visibility of mining operations to Wyoming Highway 338 and adjacent landowners	Negligible to moderate, short-term on mine area and adjacent areas	No impact due to mining
IMPACTS FOLLOWING RECLAMATION could be:		
Smoother sloped terrain	Negligible, long term on mine area	No impact due to mining
Reduction in sagebrush density	Negligible, short term on mine area	No impact due to mining
NOISE		
INCREASED NOISE LEVELS could affect:		
Nearby occupied dwellings	Negligible to moderate, short term on adjacent areas	No impact due to mining
Wildlife in immediate vicinity	Negligible, short term on mine and adjacent areas	No impact due to mining
TRANSPORTATION FACILITIES		
Increase in coal shipped on existing railroads	Negligible, short term on mine area	No impact due to mining
New employees travel on highways for duration of mining operations	Negligible, short term on mine area	No impact due to mining
Relocation of pipelines	Potential moderate, short term on mine area	No impact due to mining
Relocation of utility lines	No impact on mine area	No impact due to mining
Construction and operation of overland coal conveyor and loadout facilities	Moderate, short-term on areas adjacent to facilities	No impact due to mining
SOCIOECONOMICS		
EFFECTS DURING MINING would include:		
Employment Potential (Up to 70 jobs in mine area is expected)	Moderate, beneficial short term	No impact due to mining
Revenues from taxes to the state government	Moderate, beneficial short term	No impact due to mining
Revenues from taxes to the federal government	Small, beneficial, short term	No impact due to mining
Revenues from taxes to local governments	Moderate, beneficial short term on mine area	No impact due to mining
Economic development	Moderate, beneficial short term on mine area	No impact due to mining
Depreciation of property values for adjacent landowners	Moderate, short term	No impact due to mining
Population in Sheridan County	No impact due to mining	No impact due to mining

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	*MAGNITUDE TYPE AND DURATION OF IMPACT*	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
TOPOGRAPHY & PHYSIOGRAPHY		
RECOVERY OF COAL AND RECLAMATION could result in:		
Sixteen percent increase in area of topographic moderation due to surface coal mining	Moderate, long term on mine areas	No added impact due to Ash Creek Mine
Overlapping changes in topography due to coal and CBM development	Negligible, short term on mine areas	Same as Proposed Action for existing surface mines
GEOLOGY AND MINERALS		
RECOVERY OF COAL AND RECLAMATION would result in:		
Sixteen percent increase in area of surface mining disturbance in area	Moderate, long term on mine areas	No added impact due to Ash Creek Mine
Overlapping impacts due to coal and CBM development	Moderate, short term on mine areas	Same as Proposed Action for existing surface mines
SOILS		
RECOVERY OF COAL AND RECLAMATION could result in:		
Sixteen percent increase in area of surface mining disturbance and reclamation in area	Moderate, beneficial and adverse, long term on mine areas	No added impact due to Ash Creek Mine
Overlapping soil disturbance due to coal mining and CBM development	Moderate, short term	Same as Proposed Action for existing surface mines
AIR QUALITY		
CUMULATIVE IMPACTS ASSOCIATED WITH MINING OPERATIONS AND WY PRB OIL AND GAS EIS ALTERNATIVE 1 AND MT OIL AND GAS EIS ALTERNATIVE E would include:		
Cumulative near-field concentrations of criteria pollutants	Above PSD Class II increment for PM_{10} 24-hour. Concentrations of other pollutants below increments	Same as Proposed Action
Cumulative far-field concentrations of NO_2 annual	Above PSD Class I increment in Northern Cheyenne Reservation. Concentrations in other areas are below increments.	Same as Proposed Action
Cumulative far-field concentrations of PM_{10} 24-hour	Above PSD Class I increment in Northern Cheyenne Reservation and Washakie Wilderness. Concentrations in other areas are below increments.	Same as Proposed Action
Cumulative visibility impacts in mandatory Class I areas	Potential impacts range from 3 days above 1 dV at Red Rock Lakes Wilderness to 32 days above 1 dV at Wind Cave National Park. Potential maximum deciview change is 29 dV at UL Bend Wilderness.	Same as Proposed Action
Acidification of sensitive lakes	Potential impacts are 180 percent of the level of acceptable change (LAC) in Upper Frozen Lake and 104 percent of the LAX in Florence Lake. Impacts at other lakes are below the LAC.	Same as Proposed Action

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE TYPE AND DURATION OF IMPACT	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
WATER RESOURCES		
SURFACE WATER		
IMPACTS TO SURFACE WATER could result in:		
Overlapping drainage basin disturbances and decreased flows due to surface coal mining	Negligible, short term	Same as Proposed Action for existing surface mines
Offsetting changes in surface flow due to overlapping impacts of CBM development and surface coal mining	Negligible, short-term, beneficial	Same as Proposed Action for existing surface mines
GROUNDWATER		
IMPACTS ON GROUNDWATER could result in:		
Overlapping impact between mines due to replacing coal aquifers with backfill aquifers	No cumulative impacts anticipated on mine areas	Same as Proposed Action for existing surface mines
Overlapping drawdown in the coal and alluvial aquifers between surface mines	Negligible, short to long term	Same as Proposed Action for existing surface mines
Overlapping drawdown in the coal aquifer due to surface mining and CBM development	Moderate, short term	Same as Proposed Action for existing surface mines
Water-level decline in the sub-Dietz 3 coal aquifers	No cumulative impacts anticipated in mine areas	Same as Proposed Action for existing surface mines
Change in groundwater quality as a result of mining	No cumulative impacts anticipated in mine areas	Same as Proposed Action for existing surface mine areas
ALLUVIAL VALLEY FLOORS	No cumulative impacts anticipated on mine areas	Same as Proposed Action for existing surface mine areas
WETLANDS		
Removal of existing wetlands	No cumulative impacts anticipated on mine areas	Same as Proposed Action for existing surface mine areas
VEGETATION		
RECOVERY OF COAL AND RECLAMATION would result in:		
Sixteen percent increase in area of vegetation disturbance and reseeding due to coal mining	Moderate, long term on mine areas	No added impacts due to Ash Creek Mine
Overlapping vegetation disturbance due to coal mining and CBM development	Moderate, short term	Same as Proposed Action for existing surface mines

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	*MAGNITUDE TYPE AND DURATION OF IMPACT*	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
WILDLIFE		
IMPACTS ON WILDLIFE FROM OVERLAPPING SURFACE MINING AND OTHER DEVELOPMENT could result in:		
Loss of pronghorn habitat	Moderate, short term	No added impacts due to Ash Creek Mine
Mule deer and white-tailed deer population reduction	Negligible, short term	No added impacts due to Ash Creek Mine
Reduction in raptor nesting sites and foraging habitat	Negligible, short term	No added impacts due to Ash Creek Mine
Reduction in sage grouse leks	Moderate, short term	No added impacts due to Ash Creek Mine
Loss of nesting and foraging habitat for Migratory Birds of Management Concern	Negligible, short term	No added impacts due to Ash Creek Mine
Reduction in waterfowl habitat	Minor, short term	No added impacts due to Ash Creek Mine
Reduction in wildlife habitat diversity	Moderate, long term on mine areas	No added impacts due to Ash Creek Mine
Reduction in some wildlife carrying capacity	Moderate, long term on mine areas	No added impacts due to Ash Creek Mine
THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES		
See Appendix E and T&E section in Table 2-4		
LAND USE AND RECREATION		
IMPACTS ON LAND USE could result in:		
Loss of agricultural production	Moderate, short term on mine areas	No added impacts due to Ash Creek Mine
Disruption of oil and gas development/production	Moderate to significant, short term on mine areas	Same as Proposed Action for existing surface mine areas
Reduction of wildlife habitat	Moderate, short term on mine areas	No added impacts due to Ash Creek Mine
IMPACTS ON RECREATION could result in:		
Loss of access to lands used by recreationists, particularly hunting	Negligible, short term on mine areas	No added impacts due to Ash Creek Mine
CULTURAL RESOURCES	Sites eligible for NRHP would be mitigated on mine areas. Ineligible sites may be destroyed.	Same as Proposed Action for existing surface mines
NATIVE AMERICAN CONCERNS	No impact identified on mine areas	No added impacts due to Ash Creek Mine

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

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

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE TYPE AND DURATION OF IMPACT***	
RESOURCE NAME	**PROPOSED ACTION**	**NO ACTION ALTERNATIVE**
PALEONTOLOGICAL RESOURCES	No impact identified on mine areas	No added impacts due to Ash Creek Mine
VISUAL RESOURCES		
Impacts on visual resources by mining activities	No overlapping impacts with existing mines	No added impacts due to Ash Creek Mine
NOISE	No overlapping impact with existing mines	No added impacts due to Ash Creek Mine
TRANSPORTATION FACILITIES		
Increased use of existing transportation facilities	Negligible, short term	No added impacts due to Ash Creek Mine
SOCIOECONOMICS		
IMPACTS ON SOCIOECONOMICS could include:		
Stabilization of municipal and county economics	Moderate, beneficial, short term	No added impacts due to Ash Creek Mine
Employment	Moderate, beneficial, short term	No added impacts due to Ash Creek Mine
Federal, State, and Community Tax Revenues	Significant, beneficial, short term	No added impacts due to Ash Creek Mine

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

3.0 AFFECTED ENVIRONMENT

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

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

3.1 Bridger Lands

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

Topography and Physiography

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

Geology and Mineral Resources

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

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

from a surface mine located approximately 20 miles south of the Bridger lands.

Water Resources

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

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

Soils

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

Vegetation

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

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

See Appendix E for discussion of threatened, endangered, proposed, and candidate plant species that USFWS has identified as potentially present in this area, and plant species that USFS and BLM have identified as potentially present Sensitive Species in the area of the Bridger lands.

Wildlife

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

The Bridger lands proposed for USFS acquisition (western tracts and a portion of one eastern tract) provide habitat for many wildlife species. Species present include small animals such as hares,

grouse, beavers, neo-tropical migrant birds, and coyotes. Harvested animals such as elk, deer, moose, mountain lions, and black bears are present as well as a number of threatened, endangered, proposed, candidate, and sensitive species. The USFS Bridger tracts serve as summer, winter, and parturition range for these species and also contain important migration corridors between summer and winter ranges.

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

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

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

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

See Appendix E for discussion of threatened, endangered, proposed, and candidate wildlife species that USFWS has identified as potentially present in this area, and wildlife species that USFS and BLM have identified as potentially present Sensitive Species in the area of the Bridger lands.

Land Use

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

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

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

Transportation

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

Cultural Resources

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

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

Native American Consultation

The Mahogany Site, a prehistoric pictograph site of reported Ute affinity, is located a few miles from

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

3.2 JO Ranch Lands

The JO Ranch property, located in southwest Carbon County, Wyoming, includes approximately 1,236.5 acres that are primarily along the valley floor of Cow Creek (Figures 1-1 and 1-3).

Topography and Physiography

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

Geology and Mineral Resources

The JO Ranch lands are located in the Washakie Basin, which contains oil and gas reserves. There are actively producing conventional oil and gas wells in the vicinity of the JO Ranch lands but, according to WOGCC records, there are currently no producing conventional oil and gas wells on the lands proposed for exchange. Portions of the JO Ranch lands are underlain by coal beds. The coal in this area is not economically mineable and there are no operating coal mines in this area. There is proposed development in the area of the lands proposed for exchange. One CBM test well was drilled in 1999 on one 40-acre lot included in the exchange proposal; however, there is no record of any production from that well. A search of the WOGCC records in March 2003 revealed that there are no CBM wells completed or permitted to be drilled within the JO Ranch lands tract.

Water Resources

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

Soils

In general, soils in the area were formed under a dry, cool climate with spring moisture, have low organic matter, and are formed from residuum on bedrock-controlled uplands and in alluvium associated with streambeds and floodplains. Shallow soils occur on areas underlain by bedrock and in areas of steeper topography. Deep soils are present on alluvial deposits. Soil productivity is naturally low because low precipitation rates produce limited vegetation cover,

consequently limited organic matter for the soil is available.

Vegetation

The bottom lands along Cow Creek are mostly a riparian-grassland habitat type, dominated by Nebraska sedge, beaked sedge, tufted hairgrass, redtop, Kentucky bluegrass, and a variety of forbs. At the upper end of the creek there are willows and waterbirch. The uplands consist of Wyoming big sagebrush and mixed grass habitat types, with local areas along the west boundary containing a high percentage of bitterbrush. The northern portion of the JO Ranch lands lies at the edge of the Sand Hills (Figure 1-3), which contain a mixture of shrubs including silver sagebrush, basin big sagebrush, Douglas and rubber rabbitbrush, bitterbrush, rose, serviceberry, snowberry, and chokecherry. Needle-and-thread grass and prairie sandreed are the dominant grasses along with other grasses and forbs. The overall condition of these plant communities is good. Thistles may be present in the meadow habitat, but no noxious plant species are known to occur in this area. Both the riparian and sand hills plant communities are important in terms of the plant and animal life they support and neither are very common in terms of total acreage in this area.

See Appendix E for discussion of threatened, endangered, proposed, and candidate plant species the USFWS has identified as potentially present in this area, and plant species that USFS and/or BLM have identified as potentially present Sensitive Species in the area of the JO Ranch lands.

Wildlife

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

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

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

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

See Appendix E for discussion of threatened, endangered, proposed, and candidate wildlife species that USFWS has identified as potentially present in this area, and wildlife species that USFS and/or BLM have identified as potentially present Sensitive Species in the area of the JO Ranch lands.

Land Use

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

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

Cultural

The JO Ranch lands include the JO Ranch or Rankin Ranch buildings, which are a collection of stone buildings that date from the late 1800s. These buildings are eligible for National Historic Site status.

Native American Consultation

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

Transportation

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

3.3 Welch Lands

The Welch lands, located in north-central Sheridan County, Wyoming, are in the same general area as the PSO Tract (the federal coal lands that P&M proposes to acquire in Sheridan County), which is described below in Section 3.4 (Figure 3-1). The Welch lands are located in the PRB, a part of the Northern Great Plains which includes most of northeastern Wyoming and a portion of southeastern Montana. The Big Horn Mountains are within sight of the Welch lands to the west.

Topography and Physiography

The Welch lands occupy a portion of the Tongue River valley floor and the adjacent dissected uplands between

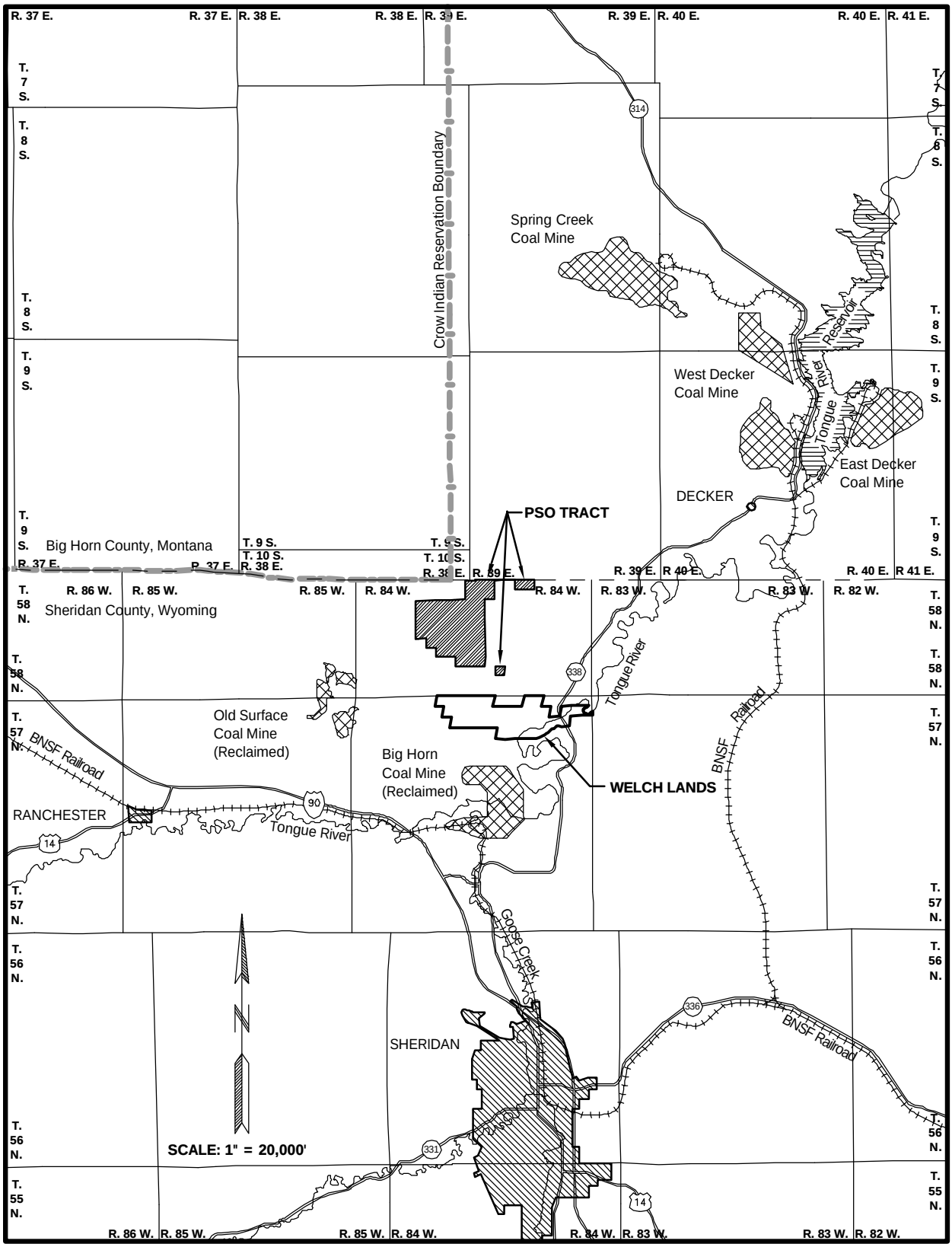


Figure 3-1. General Analysis Area.

Ash Creek and Hidden Water Creek, both tributaries of the Tongue River (Figures 1-4 and 3-2).

Geology and Mineral Resources

The Welch lands are underlain by coal. There is a long history of coal mining activities in the Sheridan Coal Field. Coal was mined extensively from some surface strip mines and numerous underground mines that were located primarily along the Tongue River upstream of the Welch lands. Coal beds that were mined in this area include, in descending order, the Dietz 2, Dietz 3, Monarch, and Carney. Underground coal mining began in the late 1800s and continued into the early 1950s. Many square miles of room and pillar underground mine workings extend on both sides of the confluence of Goose Creek with the Tongue River, located about three miles south-southwest of the Welch lands. The closest underground mine, the Acme Mine No. 42, extends beneath a portion of the Welch lands (Figure 3-3). Maps of the Acme Mine that were prepared in 1940 show the approximate extent of mining at that time. According to a U.S. Geological Survey Professional Paper on this area (Dunrud and Osterwald 1980), this mine was active from 1911 through 1940 and produced coal from the Monarch coal bed. According to the book 'Black Diamonds of Sheridan' (Kuzara 1977), mining in the Acme Mine No. 42 continued until about 1942. Taff, in USGS Bulletin 341-B (Taff 1909) mentions the Evans mine, where coal was mined for domestic use prior to 1909. That publication reports an Evans mine along the west bank of the Tongue River in the south half of Section 2, T.57N., R.84W. This suggests the possibility that underground mine workings exist on the Welch lands beyond the mapped limits. The underground mines in the Sheridan Coal Field were all closed and sealed off by 1953, following the railroad's conversion from coal to petroleum fuel and the advent of surface coal mining.

Roof collapses over the closed Acme Mine No. 42 led to the development of underground coal fires in the Monarch and possibly Carney coal beds. Most of these fires apparently started in the abandoned underground mines by spontaneous combustion when oxygen and water were introduced to the mine workings through subsidence cracks and pits and unsealed portals or shafts (Dunrud and Osterwald 1980). The Monarch has been burning sporadically for many years. As the fire advances in the Monarch bed, the overburden collapses, the overlying Dietz 3 and Dietz 2 beds also collapse, and the resulting subsidence fractures and cracks may be allowing air to circulate and cause these overlying coal beds to catch on fire as well (Figure 3-3). The WDEQ/AMLD has conducted a number of reclamation and emergency rehabilitation projects over the past 20 years in attempts to extinguish these fires. Mine maps obtained from OSM's Mine Map Repository show that most of the Monarch coal seam in the SE¼ SE¼ of Section 3, T.57N., R84W., which is included in the Welch lands area, was mined out as

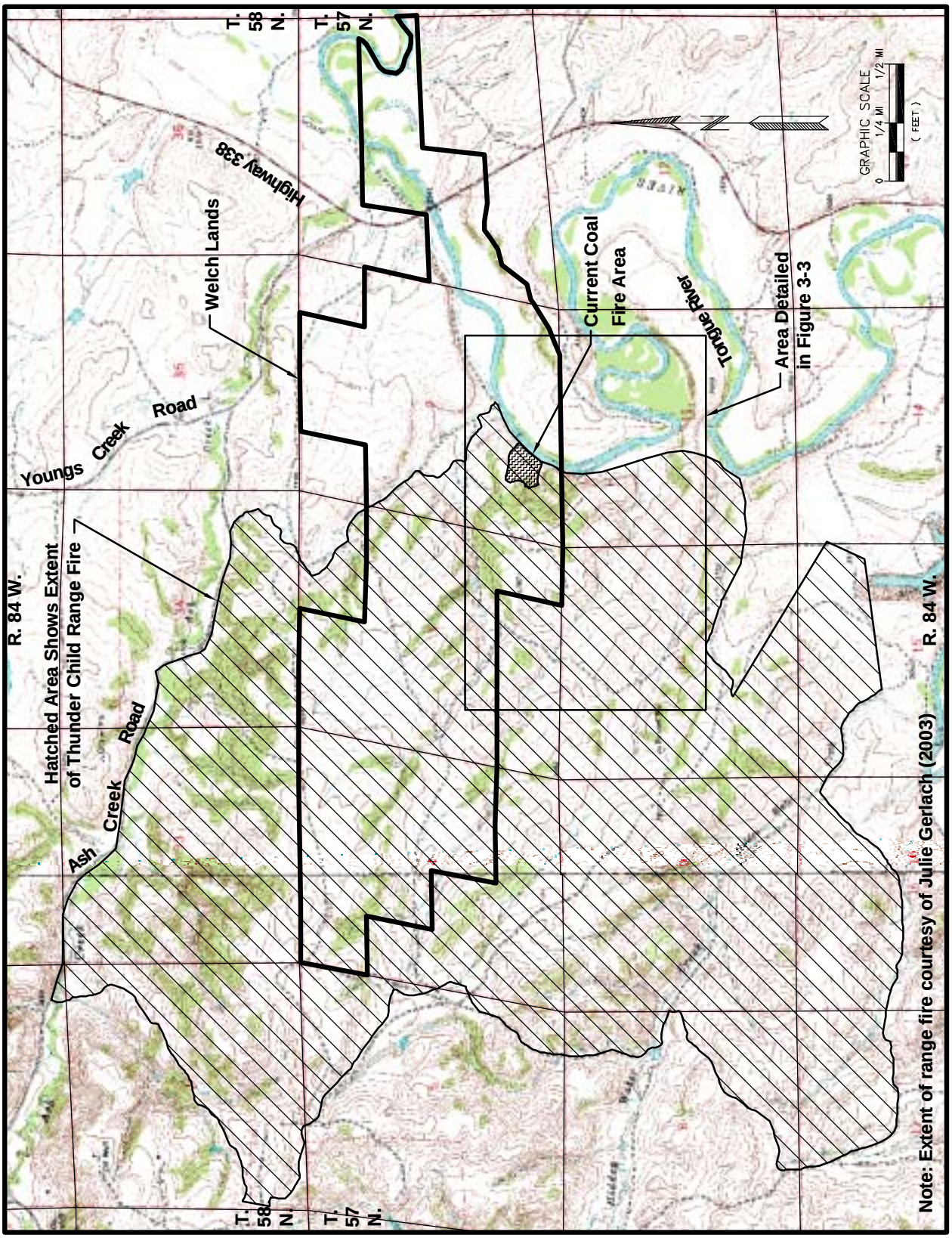


Figure 3-2. Welch Lands and Extent of Thunder Child Range Fire.

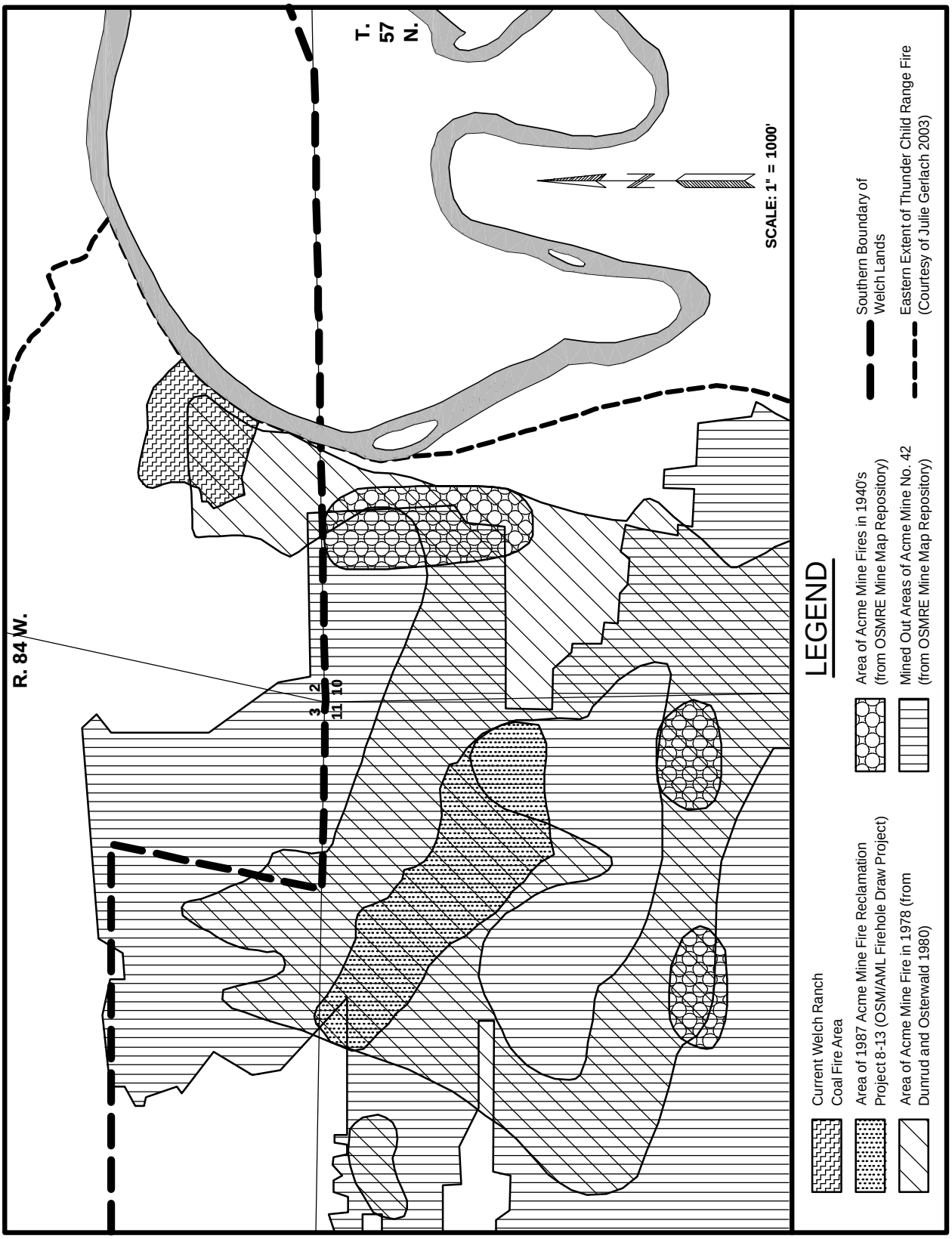


Figure 3-3. Extent of Underground Acme Mine and Coal Fire Areas on the Welch Lands and Vicinity.

part of the Acme Mine No. 42 mining operations (Figure 3-3). A prehistoric burn line kept the mine from advancing further north. Only limited mining was shown in the SW¼ of Section 2, T.57N., R.84W.

An underground coal fire is currently burning in the SW¼ SW¼ of Section 2 (Figure 3-3). This coal seam fire is probably related to the underground coal fires at the abandoned Acme Mine No. 42. Less likely alternatives are that the fire on the Welch lands originated from a spontaneous outcrop fire or resulted from roof collapse related to the small Evans mine mentioned in USGS Bulletin 341-B (Taff 1909) in this immediate area. Concerns expressed about the presence of this underground coal fire on lands the federal government is considering acquiring led to the preparation of a technical report on the coal fire by BLM in March 2003. This report is included as Appendix D in this EIS, and information from this report is summarized in the preceeding and following discussions.

Figure 3-3 shows the known extent of the Acme mine fires in 1940, the known extent of the fires in 1978, the mined-out area of Acme Mine No. 42, and the area of current burning in Section 2, T.57N., R.84W. Based on this information, the coal mine fire has moved north several hundred feet in the past 24 years.

The coal fire in Section 2, T.57N., R.84W. occupies a hillside between and north of two draws along the west bank of the Tongue River (Figure 3-3). The hillside is bare of trees and shrubs; only grasses grow. Partly burned ponderosa pine and juniper trees are present along the perimeter of this area. The treeless area occupies approximately 13 acres. There is evidence, in the form of cracks and fissures as much as several feet deep, that the coal underlying the upper part of the hillside is actively burning at this time. Some of these fissures have been filled in.

There are three coal beds present below the surface of the hillside, the Dietz 2, Dietz 3, and Monarch. The main burning at the site appears to be occurring in the Dietz 3 coal bed. Data are lacking as to whether the Monarch has burned at this site, although it has burned or is burning over a large area south of the Welch lands.

In September of 2002, contractors for the WDEQ/AMLD worked onsite to stabilize the north end of the fire on the Welch lands. The smaller cracks were excavated to the base of each crack (six to eight feet on average), filled with two feet of crushed scoria fines and backfilled the rest of the way with country rock. The larger cracks were filled with a slurry of scoria fines and water. A visit to the site by BLM Buffalo Field Office personnel in February 2003 found that this action did not extinguish the fire (see Appendix D).

A wild fire, the Thunder Child Range Fire, burned 5,207 acres, including portions of the Welch lands, in late July of 2001 (Figure 3-2). The fire originated in the vicinity of the underground coal seam fire in the

SW¼ of Section 2, T.57N., R.84W. The cause of the fire is undetermined, but potential causes include a lightning storm and/or the underground coal seam fire (see additional discussion in Appendix D).

P&M acquired its ownership in the Welch lands in October 1998. The previous owners obtained a permit to mine coal in a portion of the Welch lands in 1979 and began stripping topsoil to access shallow coal reserves on the property. A short haul road was also constructed. Plans to mine the area were canceled and, because minor surface disturbance had occurred and mining was not anticipated in the foreseeable future, the disturbed area was reclaimed under the direction of WDEQ in 1999. Currently there are no active surface coal mines in Sheridan County, although large-scale surface mining is being conducted approximately eight miles northeast of the Welch lands in Montana. In the past few years CBM has been developed in this area (refer to Section 3.4.3 for additional discussion of CBM development in this area). A search of the WOGCC records in March 2003 revealed that there are 16 CBM wells permitted to be drilled within the Welch lands.

Water Resources

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

Soils

The soils in the area of the Tongue River valley are dominated by very deep soils on the flood plain, low terraces, and alluvial fans. The soil association is described as a Haverdad-Ziegweid-Nuncho. The soils developed predominantly in residuum on the upland areas are very similar to those soils on the PSO Tract listed in Section 3.4.4.

Vegetation

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

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

See Appendix E for discussion of threatened, endangered, proposed, and candidate species that USFWS has identified as potentially present

in this area, and plant species that USFS and/or BLM have identified as potentially present Sensitive Species in the area of the Welch lands.

Wildlife

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

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

See Appendix E for discussion of threatened, endangered, proposed, and candidate wildlife species that USFWS has identified a potentially present in this area, and wildlife species that USFS and/or BLM have identified as potentially present Sensitive Species in the area of the Welch lands.

Ownership and Use of Land

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

The property consists predominantly of unimproved rangeland, scattered pine and juniper forests in deep drainages, and hay croplands typical of a flood and subirrigated AVF. A large portion of the upland woodlands was burned in a July 2001 wildfire.

Historically, the property has been used principally for livestock grazing, with crop production concentrated along portions of the valley floor of the Tongue River. Since the property was settled in the early 1900s, grazing practices have been relatively unchanged. The current surface leaseholder grazes a small number of cattle in the area.

Currently, development and associated disturbance on the property include an irrigation ditch, a diversion dam, fences, utility easements, a reclaimed gravel pit, reclaimed surface mine operations (described in the section on Geology and Mineral Resources), the previously mentioned area where contractors for the WDEQ/AMLD worked onsite to stabilize the north end of the coal fire on the Welch lands, and unimproved dirt roads and trails.

Recreational opportunities on the lands include big game and game bird hunting (both upland and waterfowl) and sport fishing. The Tongue River valley offers a greater diversity of game bird habitat than is found on the adjacent lands, and the Tongue River in this area is a good small-mouth bass fishery

resource. White-tailed deer hunters may also experience success on the Welch lands because the denser riparian vegetation within the Tongue River valley is a habitat that is preferred by the deer. In addition, the two-track ranch roads and trails that traverse the property provide access for other outdoor activities such as hiking, biking, and photography.

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

Cultural Resources

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

Native American Consultation

None of the inventoried sites included in the Welch lands are known to be of interest to or considered sensitive by modern Tribal individuals. Consultation and/or site visits have not been conducted. If these lands are acquired by the BLM, consultation would take place when management of these lands is incorporated into the *Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office*.

Transportation

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

3.4 PSO Tract

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

3.4.1 General Setting

The PSO Tract, like the Welch lands, is located in the PRB, a part of the Northern Great Plains which includes most of northeastern Wyoming and a large portion of southeastern Montana. Vegetation is primarily sagebrush, mixed

prairie grass, and ponderosa pine with a shrub understory. The climate is semi-arid and characterized by cold winters, warm summers and a large variation in annual and seasonal temperature and precipitation. Wind, precipitation, and temperature patterns in the study area are significantly affected by the Big Horn Mountain range, which is within sight of the project area to the west.

The average annual precipitation at Sheridan (Figure 3-1) for the period of record 1920-2000 is just over 15 inches (WRCC 2001). The annual precipitation records for the period of record 1949-1974 near the Decker Coal Mine (Figure 3-1) ranged from a low of about 6.5 inches in 1960 to a high of about 17.6 inches in 1968, with an average of about 11.8 inches. About 45 percent of the annual precipitation falls in the three-month period April through June. In Sheridan, June (2.79 inches) and May (2.54 inches) are the wettest months, and February (0.48 inch) is the driest. Nearly 30 percent of the annual precipitation falls as snow from October through March. Snowfall averages 44.8 inches per year, with most occurring in March (9.2 inches) and January (7.6 inches). The remainder of the annual precipitation generally occurs as summer thunderstorms, and most flooding in the area occurs in response to high-intensity thunderstorms of comparatively short duration. Potential evapotranspiration at approximately 22 inches (Martner 1986) exceeds annual precipitation.

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

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

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

BLM coal leasing study (BLM 1996e).

3.4.2 Topography and Physiography

The PRB is an elongated, asymmetrical structural downfold. It is bounded by the Casper Arch, Laramie Mountains, and Hartville Uplift to the south; the Miles City Arch in Montana to the north, the Big Horn Mountains on the west, and the Black Hills on the east. The PSO Tract is located near the northwest limb of the structural basin, near the Tongue River valley and within sight of the Big Horn Mountains. The PRB landscape consists of broad plains, low hills, and tablelands. Generally, the topography changes from open hills with 500-1,000 ft of relief in the northern part of the PRB to plains and tablelands with 300-500 ft of relief in the southern part. Playas are common in the basin, as are buttes and plateaus capped by clinker or sandstone.

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

3.4.3 Geology

Stratigraphic units in the proposed Ash Creek Mine area that would be impacted if the exchange is completed and a mine is opened are, in descending order, recent (Quaternary age) alluvial and eolian deposits and the Paleocene age Fort Union Formation (which contains the target coal beds). Figure 3-4 shows two geologic cross-sections drawn through the proposed Ash Creek Mine area (one roughly north-south and one northeast-southwest). These cross sections are a basic representation of the geology in the vicinity of the PSO Tract. Figure 3-5 is a chart showing the stratigraphic relationships and hydrologic characteristics of the surface and subsurface geologic units in the area of the PSO Tract.

Surficial deposits in the analysis area include Quaternary alluvial, colluvial and eolian deposits, clinker, and weathered Fort Union Formation. There are alluvial deposits, consisting of floodplain, stream and terrace deposits, along the area's major drainages (Ash Creek, Youngs Creek, Little Youngs

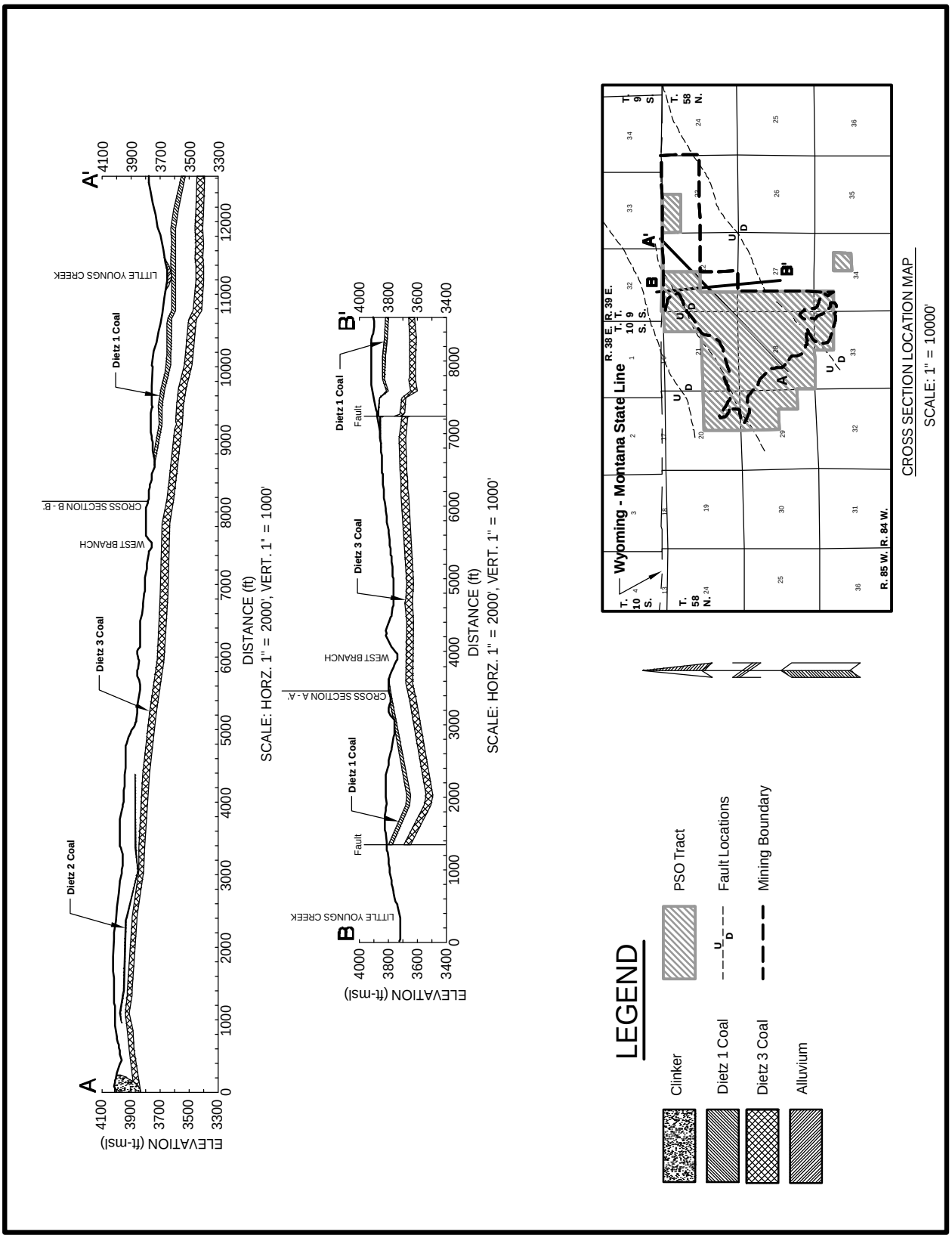


Figure 3-4. Geologic Cross Sections for the Ash Creek Mine.

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

Figure 3-5. Stratigraphic Relationships and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary, and Recent Geologic Units, Powder River Basin, Wyoming. (Compiled from Hodson et al. 1973 and Lewis and Hotchkiss 1981).

Creek, and West Branch Little Youngs Creek). In general, these alluvial sediments are composed of interbedded silts and clays overlying beds of sand and gravel. Unconsolidated materials that occupy the bottom of the Little Youngs Creek drainage have a maximum thickness of about 40 ft, including as much as 23 ft of interbedded sand and gravel, generally overlain by finer-grained materials (Hedges et al. 1980). The gravel consists primarily of rounded to subrounded detrital clinker with a maximum particle size of approximately two inches in diameter (Ash Creek Mining Company 1984). Colluvium, sheetwash, and residual deposits derived from the Fort Union Formation bedrock occur on the uplands and slopes.

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

The Fort Union Formation is approximately 3,400 ft thick in this vicinity and consists primarily of interbedded shales, mudstones, siltstones, lenticular sandstones, and coal. It is divided into three members: Tongue River (which contains the target coal seams), Lebo, and Tullock, in descending order (Figure 3-5).

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

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

throughout the remainder of this EIS.

Thickness of the coal seams varies across the PSO Tract area. The Dietz 1 coal seam is present only in the northern half of the site because of erosion and burning, and its thickness increases from approximately five ft to an average of approximately 20 ft in Sections 22 and 23 of T.58N., R.84W. The Dietz 3 seam is present across the proposed mining area and ranges in thickness from approximately 10 to 50 ft, averaging about 41 ft. Overburden above the Dietz 1 seam ranges from approximately one to 275 ft in thickness. The overburden above the Dietz 3 where Dietz 1 is not present is from 20 to 120 ft thick. The interburden thickness between the Dietz 1 and Dietz 3 seams ranges from 20 to 140 ft, with a thickening trend from east to west.

The stratigraphy in the PSO Tract area is similar to that found at the other surface coal mining sites in the general area (Figure 3-1). Overburden and interburden consists of scoria (clinker), siltstone, shale, and minor sandstone units. Clinker is the result of prehistoric coal fires, which heated the rock overlying the burning coal beds and produced the baked and fused clinker. Clinker is present at several locations in the PSO Tract area, particularly to the south where the Dietz seams crop out at the surface.

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

The portion of the Tongue River Member that is below the Dietz 3 coal bed and the Lebo Shale and Tullock Members of the Fort Union Formation, which underlie the Tongue River Member (Figure 3-5), would not be disturbed if mining occurs. These two lower members of the Fort Union Formation consist primarily of sandstone, siltstone, mudstone, shale, and coal. In general, the Tullock Member contains more sand than the Lebo Shale Member.

3.4.3.1 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 (clinker) are mined in the PRB (BLM 1996f).

Coal

Some of the largest accumulations of subbituminous coal reserves in the world are contained within the

PRB. Surface coal mining occurs where the coal is at its shallowest depth, i.e., nearest the outcrops along the eastern and western edges of this structural basin. Active surface coal mining in the PRB is centered in two general zones: the eastern side of the basin and the western side of the basin. The eastern zone is in Campbell and Converse Counties, starting about 20 miles north of Gillette, Wyoming and extending south for about 75 miles. The major producing seams in that area are the Fort Union Formation's Anderson and Canyon coal seams (combined they form the Wyodak seam). The western zone is an area between Sheridan, Wyoming (the Sheridan Coal Field) and Colstrip, Montana. At the present time there are six active surface mines in the western zone, all of which are located in Montana. Numerous old, abandoned, underground coal mines exist immediately north of Sheridan (Section 3.3). Surface coal mines also operated immediately north of Sheridan, including the Big Horn Coal Mine, which was closed and reclaimed in 2000 and 2001, and an older unnamed strip mine, known locally as the Hidden Water Pits (see Figure 3-1). Near the Montana State line the major producing seams are the Fort Union Formation's Anderson, Dietz, and Monarch (Canyon) seams.

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

The Fort Union coal seams are subbituminous and are generally low-sulfur, low-ash coals. The quality of the recoverable coal reserves within the area of the federal coal being considered for exchange is represented by the analyses (done on an as-received basis) of recent exploration drilling samples collected by P&M. The Dietz 1 seam has a weighted average heating value of approximately 9,279 Btu/lb and contains 5.8 percent ash and 0.44 percent sulfur. The Dietz 3 seam has a weighted average heating value of approximately 9,352 Btu/lb and contains 5.4 percent ash and 0.53 percent sulfur. The volatile matter, fixed carbon and moisture percentages were not available from the analyses of these recently obtained samples, although those values for the Dietz 1 and Dietz 3

seams, respectively, as determined for the PSO No. 1 Mine area were as follows: 31.68 percent and 32.98 percent for volatile matter, 35.82 percent and 36.43 percent for fixed carbon, and 26.05 percent and 26.05 percent for moisture (Ash Creek Mining Company 1984).

Oil and Gas

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

The western portion of the PSO Tract is located near geologic structures that contain producible quantities of oil. The Ash Creek and Ash Creek South Fields, both discovered in the early 1950s, are located in T.10S., R.38E., Section 3, Big Horn County Montana, and in T.58N., R.84W., Sections 29, 30, 31, and 32, Sheridan County, Wyoming, respectively. Production is from the Upper Cretaceous Ash Creek sandstone, which lies approximately 4,600 ft below the surface in this area (Morgando 1958). See Section 3.4.11 for further discussion of wells that are currently producing and associated facilities.

Coal Bed Methane

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

Historically, methane has been reported flowing from shallow water wells and coal exploration holes in

parts of the PRB. According to DeBruin and Jones (1989), most of the documented historical occurrences have been in the northern PRB. Olive (1957) references a water well in T.54N., R.74W., which began producing gas for domestic use in 1916.

CBM has been commercially produced in the PRB since 1989 when production began at Rawhide Butte Field, west of the Eagle Butte Mine. CBM exploration and development is currently ongoing throughout the PRB in Wyoming, and it is estimated that there are now as many as 15,000 productive CBM wells in place. The predominant CBM production to date has occurred from coal beds of the Wyodak - Anderson zone in seams known as the Anderson, Canyon, Wyodak, Big George, as well as other locally-used names, like the Dietz, Monarch, and Carney beds. These are generally equivalent to the seams that are being mined by the surface mines along the eastern and western margins of the basin.

CBM development requires more extensive facilities in areas where there are splits between the coal seams. In the vicinity of the PSO Tract, the Dietz, Monarch, and Carney seams are separated by interburden that reaches 120 feet in thickness. Current CBM well completion technology within the PRB will not accommodate completion of multiple seams separated by thick shales within a single wellbore. As a result, in the areas where there are two or more coal seams separated by interburden, a "cluster" of two or more wells would be required to produce essentially the same reserve that would be produced from a single well in a single contiguous seam.

Since the early 1990s, the Wyoming BLM has completed numerous EAs and EISs analyzing CBM projects. The most recent of these was the *Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a). This document analyzed the potential impacts based on the assumption that by the year 2012, there will be about 51,000 producing private, state, and federal CBM wells and associated ancillary facilities in an almost 8,000,000-acre area covering all or parts of Campbell, Converse, Johnson, and Sheridan Counties, Wyoming. The cumulative impacts of reasonably foreseeable conventional oil and gas development within the Wyoming portion of the PRB were also analyzed.

The Montana BLM also recently completed the Montana *Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans* (BLM 2003b). The Montana document evaluated the potential impacts of drilling and producing up to 18,265 CBM wells.

Approved spacing for CBM wells in the Wyoming PRB is one well per coal seam per 80 acres, or eight well cluster locations per section. Since there are three potential productive coal seams (i.e., Dietz 3, Monarch,

and Carney) in the Ash Creek area, a total of 78 CBM wells could be drilled within the boundary of the federal coal being considered for exchange. As of March 2003, five CBM wells had been completed or spudded on privately-owned oil and gas leases within the PSO Tract. Fourteen others are permitted to drill. Two of the existing wells are currently producing.

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

Bentonite

Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, and because of this characteristic it is used in a number of processes and products, including cat litter and drilling mud. Bentonite beds are mainly found in Cretaceous marine shales, not in the Eocene continental shales, sandstones, and coals found on the PSO Tract. No mineable bentonite reserves have been identified on the PSO Tract.

Uranium

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

Scoria

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

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

3.4.4 Soils

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

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

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

The following is a list of the soil series that comprise the various map units delineated on the affected

area associated with the Proposed Action.

Soils developing predominantly in alluvial or colluvial fan deposits

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

Soils developing predominantly in residuum on uplands

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

Soils developing predominantly in eolian sand deposits

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

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

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

The soil depths and types on the PSO Tract are similar to soils currently being salvaged and utilized for reclamation at the other surface mines in the Sheridan area. The tract is expected to have an adequate quantity and quality of soil for reclamation. The site-specific soil surveys have located hydric soils and/or inclusions of hydric

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

Thickness of Suitable Topsoil (inches)	Acres	Percent
0	0.0	0.0
0 - 12	83.1	4.1
12 - 30	1,585.9	77.6
30 - 48	168.1	8.2
48 - 60	207.9	10.1
Total	**2,045.0**	**100.0**

soils. The presence of hydrophytic vegetation and wetland hydrology would be determined during jurisdictional wetland determinations included in the mine permit application package (see Section 3.4.8).

3.4.5 Air Quality and Climate

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transport of pollutants from specific source areas is strongly affected by local topography. In the mountainous western United States, topography is particularly important in channeling pollutants along valleys, creating upslope and downslope circulations that may entrain airborne pollutants, and blocking the flow of pollutants toward certain areas. In general, local effects are superimposed on the general synoptic weather regime and are most important when the large-scale wind flow is weak.

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

3.4.5.1 Topography

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

3.4.5.2 Climate and Meteorology

The general climate of the area is typical of a semi-arid high plains environment with relatively large seasonal and diurnal variations in temperature and seasonal variation in precipitation. Long-term average monthly maximum, minimum and mean temperatures for Sheridan are presented in Table 3-2. These data show the large seasonal variation in temperature with the warmest month being July, with a mean at 69.6qF, while the coldest month is January, with a monthly mean at 19.0qF. July is the month with the warmest average maximum (86.7qF) while January is the month with the coolest average minimum (5.9qF). The annual mean temperature for the area is 43.9qF.

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

The month with the highest precipitation total is June 2.9 inches while the months with the lowest totals are December, January, and February at 0.4 inch each. As is typical with a semi-arid area, year-to-year and month-to-month values temperature and precipitation can and will vary widely from the climatic averages.

Winds are greatly affected by local topographic features. Wind data have not been collected from the specific project area, but such data are available for a five-year period from Sheridan. These data (1984 and 1987 through 1990) were processed into a joint frequency distribution of wind direction by wind speed and the results are presented as a wind rose diagram in Figure 3-6. The predominant wind directions for Sheridan are from the northwest and west-northwest at 12.7 percent and 11.5 percent of the time, respectively. The annual average wind speed for the period was 8.7 mph with the strongest winds coming out of the west-northwest (12.3 mph) and northwest (12.1 mph).

Wind data are also available for the last five years (1996 through 2000) from the Decker Coal Mine. These data were also processed into a frequency distribution of wind direction and are depicted as a wind rose diagram in Figure 3-6. The prevailing wind directions recorded at the Decker Mine are from the northwest and south, both at 12.5 percent of the time. Wind directions at the Decker meteorological station are strongly influenced by the local terrain and close proximity to the Tongue River Reservoir (Figure 3-6). The PSO Tract area is characterized by the Ash Creek and Youngs Creek drainages which both flow generally from the west-northwest toward the Tongue River to the east. The area has some complex terrain, especially in the western half of the property. As such, it is anticipated that the wind flow patterns will follow relatively closely the patterns observed at Decker, but with a greater frequency of return flows from the southeast sectors, up the

Table 3-2. Average Maximum, Minimum and Monthly Mean Temperatures for Sheridan, Wyoming.

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

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

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

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

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

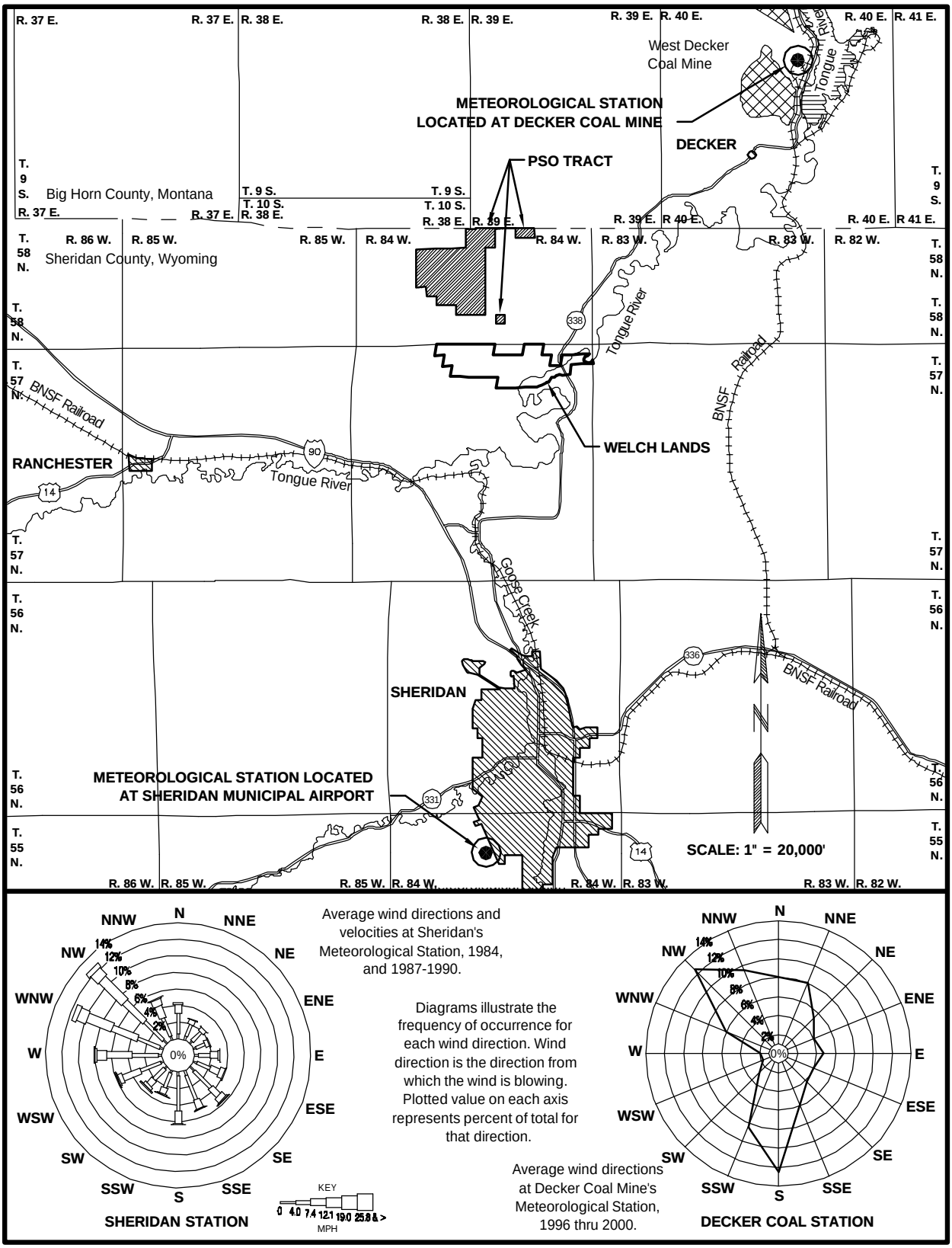


Figure 3-6. Wind Roses and Meteorological Stations at the Decker Coal Mine and Sheridan Municipal Airport near the PSO Tract.

drainage valleys, as a result of afternoon heating.

3.4.5.3 Regulatory Framework

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

The applicable federal, Wyoming, and Montana AAQS are shown in Table 3-4. While the proposed Ash Creek Mine would be located in Wyoming, the Montana AAQS are included in Table 3-4 because of the proximity of the tract to Montana.

An analysis of air quality impacts was conducted for the Wyoming and Montana BLM by Argonne National Laboratories to analyze potential air quality impacts from the oil and gas development alternatives considered in the Wyoming *Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project* (BLM 2003a) and the Montana *Statewide Final EIS and Proposed Amendment of the Powder River and Billings RMPs* (BLM 2003b). This analysis projected potential cumulative air quality impacts as a result of ongoing mineral development in the PRB, including reasonably foreseeable CBM and surface coal mining development. As part of this analysis, Argonne assembled and reviewed monitoring data measured throughout northeastern Wyoming and southeastern Montana and selected data representing the best available background air pollutant concentrations throughout the PRB in Wyoming and Montana. Table 3-4 presents the specific values that Argonne used to define background conditions in this cumulative air quality impact analysis. The assumed background pollutant concentrations are below applicable NAAQS and WAAQS for all criteria pollutants and averaging times.

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

Future development projects which have the potential to emit more than 250 tpy of any criteria pollutant (or

Table 3-4. Assumed Background Air Pollutant Concentrations, Applicable Ambient Table Air Quality Standards, and PSD Increment Values (in Pg/m^3).

Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	Wyoming Standards	Montana Standards	PSD Class I Increments	PSD Class II Increments
Carbon monoxide	1-hour	3,500[3]	40,000	40,000	40,000	40,000	---	---
	8-hour	1,500	10,000	10,000	10,000	10,000	---	---
Nitrogen dioxide	1-hour	---	---	---	---	566	---	---
	Annual	16.5[4]	100	100	100	100	2.5	25
Ozone	1-hour	82[5]	235	235	235	196	---	---
	8-hour	130[5]	157	157	157	NA	---	---
PM_{10}	24-hour	42[7]	150	150	150	150	8	30
	Annual	17[7]	50	50	50	50	4	17
$PM_{2.5}$	24-hour	19[7]	65	65	65	NA	---	---
	Annual	7.6[7]	15	15	15	NA	---	---
Sulfur dioxide	1-hour	---	---	---	---	1,300	---	---
	3-hour	8[6]	---	1,300	1,300	---	25	512
	24-hour	8[6]	365	---	260	260	5	91
	Annual	3[6]	80	---	60	60	2	20

1 Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
2 Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.
3 Amoco Ryckman Creek collected for an eight month period during 1978-1979, summarized in the Riley Ridge (BLM 1983).
4 Data collected in Gillette, Wyoming (1996 - 1997).
5 Data collected in Pinedale, Wyoming (1992 - 1994).
6 Data collected in Devil's Tower, Wyoming (1983).
7 Data collected in Gillette, Wyoming (1999).
Source: (Argonne 2002)

certain listed sources that have the potential to emit more than 100 tpy) would be required to undergo a regulatory PSD Increment Consumption Analysis under the federal New Source Review permitting regulations. Development projects subject to the PSD regulations must also demonstrate the use of BACT and show that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for NO_2, PM_{10}, or SO_2. The PSD increments are shown in Table 3-4. A regulatory PSD Increment Consumption Analysis may be conducted as part of a New Source Review, or independently. The determination of PSD increment consumption is a legal responsibility of the applicable air quality regulatory agencies, with EPA oversight. Finally, an analysis of cumulative impacts due to all existing sources and the permit applicant's sources is also required during PSD analysis to demonstrate that applicable ambient air quality standards will be complied with during the operational lifetime of the permit applicant's operations. In addition, sources subject to PSD permitting requirements would provide specific analysis of potential impairment of AQRVs such as visibility and acid rain.

Existing surface coal mining operations in the PRB are not currently affected by the PSD regulations for two reasons. Surface coal mines are not on the EPA list of 28 major emitting facilities for PSD regulation and point-source emissions from individual mines do not exceed the PSD emissions threshold of 250 tpy. A new mine would be classified as a major source if potential emissions of any regulated pollutant equal or exceed 250 tpy.

This NEPA analysis compares potential air quality impacts from the Proposed Action and Alternatives to applicable ambient air quality standards, PSD increments, and AQRVs (such as visibility), but it does not represent a regulatory PSD analysis. Comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern for potentially significant adverse impacts, and do not represent a regulatory PSD Increment Consumption Analysis. Even though the development activities would occur within areas designated PSD Class II, the potential impacts are not allowed to cause incremental effects greater than the stringent Class I thresholds to occur inside any distant PSD Class I area. Finally, the CAA directs the EPA to promulgate the Tribal Authority Rule, establishing tribal jurisdiction over air emission sources within the exterior boundaries of tribal lands. Pursuant to this rule, the Crow and Northern Cheyenne tribes north of the analysis area in Montana may request that they be treated in the same manner as a state (including Section 105 grants and formal recognition as an affected "state" when emission sources are located within 50 miles of tribal lands) under the CAA.

The WDEQ/AQD administers a permitting program to assist the agency in managing the State's air

resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category.

In order to obtain a construction permit, an operator may be required to demonstrate that the proposed activities will not increase air pollutant levels above annual standards established by the WAQSR (WDEQ/AQD 2000). The operator will also be required to utilize BACT for minimizing emissions from the facility. Monitoring may be required as a condition of the permit to construct. A permit to operate will also be required and will contain specific emission limitations and other measures of performance for operation of the facility.

The demonstration required for a construction permit often entails development of an emission inventory for the proposed facility, an estimate of the emissions from all other permitted sources of air pollutants in the vicinity, and the collection of local ambient air quality and meteorology data. This information is utilized in dispersion modeling to predict the cumulative impact of the proposed facility along with existing sources on the quality of the air in the immediate vicinity, including the impact on any special resource areas.

The CAA also provides specific visibility protection of mandatory federal Class I areas. Mandatory Federal Class I areas were designated by the U.S. Congress on August 7, 1977, and include wilderness areas greater than 5,000 acres in size and national parks greater than 6,000 acres in size. The mandatory federal Class I areas located nearest to the analysis area are listed in Table 3-5. In addition, the Northern Cheyenne Tribe (located 25 miles north of the PSO Tract in Montana) has designated their lands as PSD Class I. As shown in Table 3-4, the allowable incremental impacts for NO_2, PM_{10}, and SO_2 within these PSD Class I areas are very limited. All of the PRB in Wyoming, including the analysis area, is designated as PSD Class II with less stringent requirements.

3.4.5.4 Existing Air Quality

WDEQ detects changes in air quality through monitoring and maintains an extensive network of air quality monitors throughout the state. Particulate matter is most commonly measured as particles finer than 10 microns or PM_{10}. The eastern side of the PRB has one of the most extensive networks of monitors for PM_{10} in the nation due to the density of coal mines. There are also monitors in Sheridan and Gillette, Wyoming and WDEQ installed monitors in Arvada and Wright, Wyoming in November 2002 (Figure 3-7).

WDEQ uses monitoring stations located throughout the state to anticipate issues related to air quality. These monitoring stations are located to measure ambient air quality and not located to measure impacts from a specific source.

Table 3-5. Approximate Distances and Directions from the General Analysis Area to PSD Class I and Class II Sensitive Receptor Areas.

Receptor Area	Distance (miles)	Direction to Receptor
Mandatory Federal PSD Class I		
Badlands Wilderness Area[1]	215	SE
Bridger Wilderness Area	174	SW
Fitzpatrick Wilderness Area	166	SW
Gates of the Mountains Wilderness Area	269	WNW
Grand Teton National Park	184	WSW
North Absaroka Wilderness Area	119	WSW
Red Rock Lakes Wilderness Area	235	W
Scapegoat Wilderness Area	312	NW
Teton Wilderness Area	148	WSW
Theodore Roosevelt National Park (North Unit)	250	NE
Theodore Roosevelt National Park (South Unit)	215	NE
UL Bend Wilderness Area	176	NNW
Washakie Wilderness Area	126	WSW
Wind Cave National Park	190	SE
Yellowstone National Park	146	W
Tribal Federal PSD Class I		
Fort Peck Indian Reservation	215	NNE
Northern Cheyenne Indian Reservation	25	N
Federal PSD Class II		
Absaroka-Beartooth Wilderness Area	130	W
Agate Fossil Beds National Monument	237	SE
Bighorn Canyon National Recreation Area	55	W
Black Elk Wilderness Area	173	SE
Cloud Peak Wilderness Area	36	SSW
Crow Indian Reservation	<1	N
Devils Tower National Monument	113	ESE
Fort Belknap Indian Reservation	213	NNW
Fort Laramie National Historic Site	225	SSE
Jewel Cave National Monument	165	SE
Mount Rushmore National Memorial	180	SE
Popo Agie Wilderness Area	175	SSW
Soldier Creek Wilderness Area	248	SE

The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory federal PSD Class I area. The remained of Badlands National Park is a PSD Class II area.

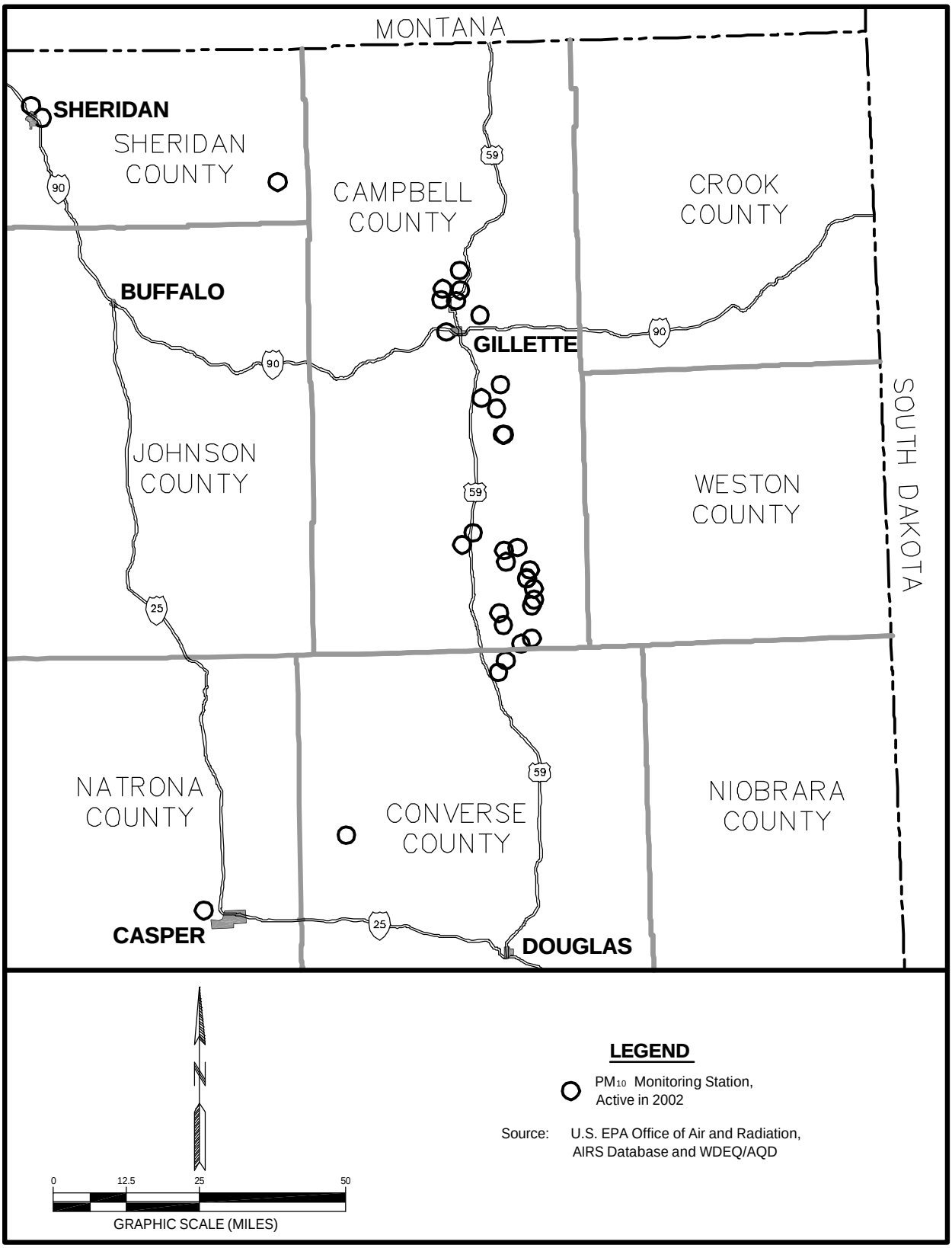


Figure 3-7. Active PM_{10} Monitoring Stations in Northeastern Wyoming.

Monitors located to measure impacts from a specific source may also be used for trends. These data are used to pro-actively arrest or reverse trends towards air quality problems. When WDEQ became aware that particulate readings in the PRB were increasing due to increased coal mining, coal bed methane activity, and exacerbated by prolonged drought, the WDEQ approached the counties, coal mines, and CBM industry. A coalition involving the counties, coal companies, and CBM operators have made significant efforts towards minimizing dust from roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads.

Monitoring is also used to measure compliance. Where monitoring shows a violation of any standard, the WDEQ can take a range of enforcement actions to remedy the situation. Where a standard is exceeded specific to an operation, the enforcement action is specific to the facility. For many facilities, neither the cause nor the solution is simple. The agency normally uses a negotiated settlement in those instances.

WDEQ has also sited two visibility monitoring stations in the PRB. One of these sites is 32 miles north of Gillette, Wyoming and includes a Nephelometer, a Transmissometer, an Aerosol Monitor (IMPROVE Protocol), instruments to measure meteorological parameters (temperature, RH, wind speed, wind direction), a digital camera, instruments to measure Ozone and instruments to measure Oxides of Nitrogen (NO, NO_2, NO_x). The other visibility monitoring station is located 14 miles west of Buffalo, Wyoming and includes a Nephelometer, a Transmissometer, an Aerosol Monitor (IMPROVE Protocol), instruments to measure meteorological parameters (temperature, RH, wind speed, wind direction), and a digital camera.

Other air quality monitoring in the PRB includes WDEQ NO_2 monitoring along the east side of the PRB, WARMS monitoring of sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle, Wyoming, and NADP monitoring of precipitation chemistry in Newcastle.

Air quality conditions in rural areas are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. Occasional high concentrations of CO and particulate matter may occur in more urbanized areas (for example, Buffalo, Gillette, and Sheridan) and around industrial facilities, especially under stable atmospheric conditions common during winter.

The major types of emissions that come from surface coal mining activities are in the form of fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, loading and hauling of overburden and coal and

the large areas of disturbed land all produce fugitive dust. Stationary or point sources are associated with coal crushing, storage, and handling facilities. In general, particulate matter (PM_{10}) is the major significant pollutant from coal mine point sources.

Blasting is responsible for another type of emission from surface coal mining. Overburden blasting sometimes produces gaseous reddish-brown clouds that contain NO_2. Exposure to NO_2 may have adverse health effects, which are discussed in Chapter 4. NO_2 is one of several products resulting from the incomplete combustion of explosives used in the blasting process. Wyoming's ambient air standards for NO_2 are shown in Table 3-4.

Other existing air pollutant emission sources within the region include:

- exhaust emissions (primarily CO and oxides of nitrogen [NO_x]) from existing natural gas-fired compressor engines used in production of natural gas and CBM; gasoline and diesel vehicle tailpipe emissions of combustion pollutants (VOCs, CO, NO_x, PM_{10}, $PM_{2.5}$, and SO_2);
- dust (particulate matter) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas, and road sanding during the winter months;
- transport of air pollutants from emission sources located outside the region;
- emissions from railroad locomotives used to haul coal (primarily NO_2 and PM_{10}); and
- SO_2 and NO_x from power plants.

3.4.5.5 Historical Ambient Air Quality: Particulates

Until 1989, the federally regulated particulate matter pollutant was measured as TSP. This measurement included all suspendable dust (generally less than 100 microns in diameter). In 1989, the federally regulated particulate matter pollutant was changed from a TSP based standard to a PM_{10} based standard. PM_{10} is particulate matter with an aerodynamic diameter of 10 microns or less that can potentially penetrate into the lungs and cause health problems. Wyoming added PM_{10} based standards to match the federal standards in 1989 and retained the TSP based standards as state standards until March 2000. Wyoming's ambient air standards for PM_{10} are shown in Table 3-4.

Regional

WDEQ/AQD requires the collection of information documenting the quality of the air resource at each of the PRB mines. Each mine monitored air quality for a 24-hour period every six days at multiple monitoring sites through the end of 2001. All PM_{10} monitors are now required by WDEQ/AQD to sample air quality for a 24-hour period every three days, beginning in 2002. Data for TSP dates back to 1980 with data for PM_{10} dating back to 1989. This has resulted in over

55,000 TSP and 14,000 PM_{10} samples collected through 2002 and makes the eastern PRB one of the most densely monitored areas in the world (Figure 3-7). Table 3-6 uses the annual arithmetic average of all sites to summarize these data.

As indicated in Table 3-6, the long-term trend in particulate emissions remained relatively flat through 1998. TSP concentration from 1980 through 1998 averaged 33.1 Pg/m, ranging between 27.8 Pg/m^3 and 39.4 Pg/m^3. There were increases in 1988 and 1996, which may have been the result of fires in the region during those years. PM_{10} concentration from 1989 through 1998 averaged 15.4 Pg/m^3, ranging between 12.9 Pg/m^3 and 16.5 Pg/m^3.

This time period (1980-1998) was associated with significant growth in the surface coal mining industry. Coal production increased from about 59 mmtpy to over 308 mmtpy (an increase of over 249 mmtpy), and associated overburden production increased from 105 mmbcy to over 710 mmbcy per year (a 605 mmbcy per year increase). From 1990 through 2002 the average annual increase in coal production was 7.0 percent, while annual overburden production increased an average of 13.9 percent over the same time period. The larger annual increase in overburden production is probably due to the fact that mines are gradually moving into deeper coals as the shallower reserves are mined out.

The relatively flat trend in particulate emissions from 1980 through 1998 is due in large part to the Wyoming Air Quality Program that requires BACT at all permitted facilities. BACT control measures include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and timely final reclamation.

As indicated in Table 3-6, the annual average TSP concentration increased from 33.9 µg/m^3 in 1998 to 55.3 µg/m^3 in 1999, and has continued to increase at a slower pace through 2002. The average annual PM_{10} concentration increased from 15.9 µg/m^3 in 1998 to 21.6 µg/m^3 in 1999, it continued to increase to 27.2 µg/m^3 through 2001, and in 2002 it was at 23.3 µg/m^3. There were no major fires in the region from 1998 through 2002. The increases in coal production over those four years (3.8 percent per year and 12.8 mmtpy over the four-year period) and associated overburden production (9.8 percent per year and 72.0 mmbcy over the four-year period) were not larger than any of the four-year increases during the previous 18 years, but the particulate concentration increase was much larger than in previous years.

As discussed above, TSP was the federally regulated pollutant until 1989 and was retained as a state regulated pollutant until 2000. PM_{10} became a federal standard in 1989 and was also adopted by the State of Wyoming. After 1989 and until recently, TSP measurements

Table 3-6. Summary of WDEQ/AQD Reports on Air Quality Monitoring in Wyoming's PRB, 1980-2002.

Year	Coal Produced (mmtpy)	Yards Moved (mmbcy)	Number of Mines Operating/ Monitoring TSP/ Monitoring PM_{10}[1]	Number of TSP/PM_{10} Monitoring Sites[2]	TSP Average (Pg/m³)	PM_{10} Average (Pg/m³)
1980	58.7	105.3	10/14/0	34/0	35.5	na[3]
1981	71.0	133.4	11/13/0	35/0	39.4	na
1982	76.1	141.1	11/14/0	40/0	31.2	na
1983	84.9	150.9	13/14/1	41/1	32.6	11.2
1984	105.3	169.5	14/16/1	42/1	33.9	11.1
1985	113.0	203.4	16/17/0	49/0	32.3	na
1986	111.2	165.7	16/17/0	45/0	29.3	na
1987	120.7	174.6	16/17/0	43/0	31.7	na
1988	138.8	209.7	16/17/0	43/0	37.7	na
1989	147.5	215.6	15/17/3	40/3	32.1	15.9
1990	160.7	223.5	17/17/5	47/5	34.3	14.8
1991	171.4	245.9	17/17/5	46/6	32.7	16.5
1992	166.1	296.0	17/17/7	41/7	31.7	15.9
1993	188.8	389.5	17/17/8	40/11	27.8	14.5
1994	213.6	483.9	17/18/8	44/11	31.7	15.5
1995	242.6	512.7	16/18/8	41/12	29.6	12.9
1996	257.0	605.4	17/18/8	41/12	35.4	16.0
1997	259.7	622.0	16/17/10	39/15	33.3	15.9
1998	308.6	710.7	16/17/12	36/17	33.9	15.9
1999	317.1	758.0	15/17/12	36/18	55.3	21.6
2000	322.5	845.3	15/15/12	31/17	56.1	23.4
2001	354.1	927.1	12/11/12	29/29	57.5	27.2
2002	359.7	1,032.1	13/11/13	23/38	56.0	23.3

1 Mines include Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union, Clovis Point, Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero, Coal Creek, Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, Rochelle, and Antelope.

2 Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

3 Not applicable because no monitoring for PM_{10} was done.

Sources: 1980 through 1996 emissions and production data from April 1997 report prepared by WMA for WDEQ/AQD. 1997 through 2002 emissions data from EPA AIRData database. 1997 through 2002 emissions and production data from WDEQ/AQD.

were used as a surrogate for PM_{10} in lieu of having to replace and/or co-locate an existing TSP sampler with a new PM_{10} sampler. There were no violations of the PM_{10} standards anywhere in the PRB through the first quarter of 2001. In 2001 and 2002 the 24-hour PM_{10} standard was exceeded several times in the southern portion of the PRB. The WDEQ/AQD is continually reviewing the data and considering regulatory options. Particulate emissions from non-mining sources have not been quantified; however, more intense monitoring and regulatory inspections have been implemented at all PRB coal mines. In addition, the proximity of the monitors where the standard was exceeded to unpaved county roads has resulted in county/industry partnerships to treat portions of these roads with chemical dust suppressants.

Control Measures

Control of particulate emissions at existing surface coal mines in the PRB is accomplished with a variety of measures. Emissions at coal crushing, storage, and handling facilities (point sources) are controlled with baghouse dust collection systems, PECs, or atomizers/foggers. These are all considered BACT controls by WDEQ/AQD.

Fugitive emissions are also controlled with a variety of measures that the agency considers BACT. Typically, mine access roads have been paved and water trucks are used to apply water and chemical dust suppressants on all haul roads used by trucks and/or scrapers. Haul truck speed limits are imposed to further help to reduce fugitive emissions from roads. Material drop heights for shovels and draglines (bucket to truck bed or backfill) are limited to the minimum necessary to conduct the mining operations. Timely permanent and temporary revegetation of disturbed areas is utilized to minimize wind erosion. Fugitive emissions from the coal truck dumps are controlled with stilling sheds. Some of the mines have participated in the control of fugitive emissions from some nearby unpaved county roads by applying dust suppressants.

Site Specific

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

In order to obtain a state air quality construction and operating permit, a surface coal mine may be required to demonstrate, through dispersion modeling, that its activities will not increase PM_{10} levels above the annual standard established by the

WAQSR (WDEQ/AQD 1995). The modeling demonstration must include the estimated air pollutant emissions from other existing pollution-generating activities, including adjacent mines, so that control of overall air quality is part of the permitting process.

Fugitive emissions from mining activities during the most active mining year at the Ash Creek Mine are estimated to be 259 tpy, but potential emissions that count towards the PSD applicability threshold would be much less than 250 tpy. Thus, the project would not be classified as a major source and would not be subject to PSD review. Again, a new mine is classified as a major source if potential emissions of any regulated pollutant equal or exceed 250 tpy. Fugitive emissions are not included in the definition of potential emissions except for certain specified source types [40 CFR 52.21, (b)(1)(iii)]. For the proposed Ash Creek Mine, fugitive emissions directly associated with the coal preparation plant would be counted toward the PTE for PSD applicability purposes. Mining related fugitive emissions are exempt from the applicability determination. Because final engineering for the coal preparation plant is not complete, it is not possible to determine the exact level of emissions that would count towards the PSD threshold at this time.

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

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

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

3.4.5.6 Historical Ambient Air Quality: NO_2

NO_2 was monitored from 1975 through 1983 in Gillette and from March 1996 through April 1997 at four locations in the PRB. Table 3-7 summarizes the results of that monitoring. Beginning in 2001 the coal industry in cooperation with WDEQ/AQD installed a network of NO_2 monitors in the PRB. The 2001 data from this regional network are summarized in Table 3-8. None of these sites are in the vicinity of the PSO Tract.

Table 3-7. Annual Ambient NO_2 Concentration Data.

Site	Gillette	Black Thunder Mine	Belle Ayr Mine	Bill
Year	**Percent of Standard[1]**	**Percent of Standard[1]**	**Percent of Standard[1]**	**Percent of Standard[1]**
1975	6*			
1976	4*			1*
1977	4*			5*
1978	11*			
1979	11			
1980	12			
1981	14			
1982	11			
1983[2]	17			
1996[3]	16	16	22	22

[1] Based on arithmetic averaging of data.
[2] Monitoring discontinued December 1983, reactivated March 1996 to April 1997.
[3] Arithmetic average – actual sampling ran from March 1996 to April 1997.
* Inadequate number of samples.
Source: McVehil-Monnett 1997

Table 3-8. 2001 Annual Ambient NO_2 Concentration Data.

Monitor	Annual Mean NO_2 Concentration (Pg/m^3)
Antelope Mine	7
Belle Ayr Mine	14
Black Thunder Mine	5*

* Data for the third quarter is questionable and therefore is not used in the determination of the annual mean for the site.

Annual NO_2 levels measured in the March 1996 to April 1997 timeframe were below applicable standards. The highest reading was 22 Pg/m^3 as compared to the 100 Pg/m$_3$ standard. All 2001 annual mean NO_2 concentrations are well below the standards of 100 Pg/m^3.

Control Measures

Some of the mines in the PRB have implemented programs designed to control/limit public exposure to the intermittent, short-term NO_2 releases associated with blasting and they all comply with the

blasting plan publication/ notification requirements associated with the Permits to Mine issued by WDEQ/LQD.

Voluntary measures that have been instituted by some mines include:

- phone notification of neighbors and workers in the general area of the mine prior to large blasts;
- monitoring of weather and atmospheric conditions prior to the decision to detonate a large blast;
- minimizing blast size to the extent possible; and
- posting of signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area.

Mine operators in the eastern PRB and blasting agent manufacturers have been working together to reduce NO_x emissions through the use of different blasting agent mixtures and additives used with regard to the relative competency of the overburden and its moisture content. Operators continue to employ new blasting techniques such as the use of sophisticated electronic detonation systems that can vary shot timing, the use of different shot hole patterns, and the use of plastic liners within the shot holes to help prevent unspent blasting agent from dispersing out into the deformable overburden rock upon detonation (Doug Emme 2003).

WDEQ has identified measures that it may require in cases where there are concerns with public exposure the blasting clouds. These measures include:

- notification of neighbors and workers in the general area of the mine prior to the blast;
- last detonation between 12:00 p.m. and 3:00 p.m. whenever possible to avoid temperature inversions and minimize inconvenience to neighbors;
- monitoring of weather and atmospheric conditions prior to the decision to detonate a blast;
- posting of signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area; and
- closing public roads when appropriate to protect the public.

3.4.5.7 Air Quality Related Values-Visibility and Acidification of Lakes

AQRVs, including the potential air pollutant effects on visibility and the acidification of lakes and streams, are applied to PSD Class I and sensitive Class II areas. The land management agency responsible for the Class I area sets LAC for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards.

Visibility

Potential impacts to visibility were considered at 29 PSD Class I and sensitive Class II areas in the vicinity of the PRB. Table 3-5 shows the nearest distances from the sensitive receptor areas to the PSO Tract.

Visibility can be defined as the distance one can see and the ability to perceive color, contrast, and detail. Fine particulate matter ($PM_{2.5}$) is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the furthest distance a person can see a landscape feature. Maximum visual range in the western United States would be about 140 miles. Presently, the visibility conditions monitored in the Bridger Wilderness Area are among the best in the United States. Visual range monitoring in the Bridger Wilderness Area shows that one can see more than 70 miles 70 percent of the time.

Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change (Pitchford and Malm 1994), and is the unit of measure used in the U. S. EPA's Regional Haze Rule to achieve the National Visibility Goal. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment. Figure 3-8 shows annual averages for the 20 percent best, worst, and middle visibility days at Badlands and Bridger Wilderness Areas from 1988 to 1998, respectively (IMPROVE 2002)[2].

Acidification of Lakes

The acidification of lakes and streams is caused by atmospheric deposition of pollutants (acid rain). Lake acidification is expressed as the change in ANC measured in Peq/L, the lake's capacity to resist acidification from acid rain. Table 3-9 shows the existing ANC monitored in some mountain lakes.

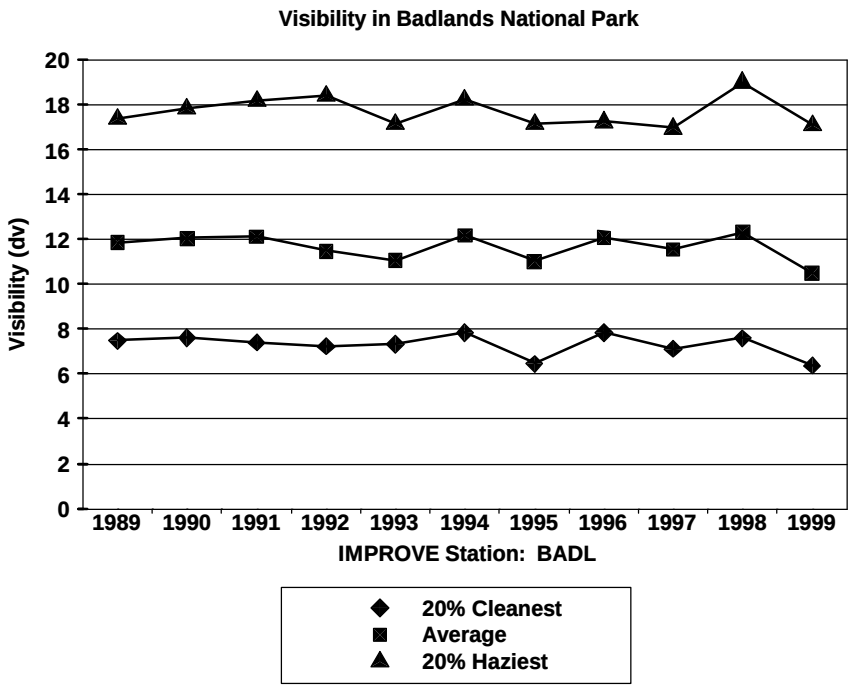
3.4.6 Water Resources

3.4.6.1 Groundwater

Within the PSO Tract there are two water-bearing geologic units that could be disturbed by mining. These units are the alluvium of West Branch, Little Youngs Creek and Youngs Creek, and the Dietz 1 and Dietz 3 coal seams. The sub-Dietz coal Fort Union Formation would not be disturbed by mining activities. The stratigraphic units beneath the PSO Tract and the hydrologic properties are displayed in Figure 3-5.

The PSO No. 1 Mine completed 17 monitoring wells near the PSO Tract in 1980; two in the Dietz 1 seam, five in the Dietz 3 seam, and 10 in the alluvium (Figure 3-9). As discussed previously, the Ash Creek Mine, as it is currently called, was initially permitted as the PSO No. 1

[2] Summaries are based on IMPROVE aerosol data using procedures from the EPA *Draft Guidance for Tracking Progress under the Regional Haze Rule*.



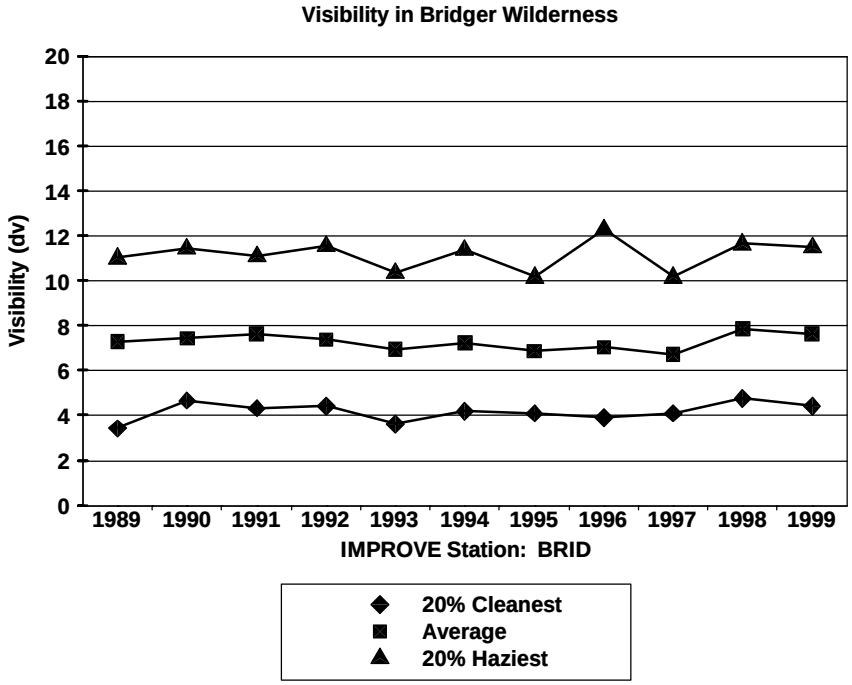


Figure 3-8. Visibility in the Badlands and Bridger Wilderness Areas.

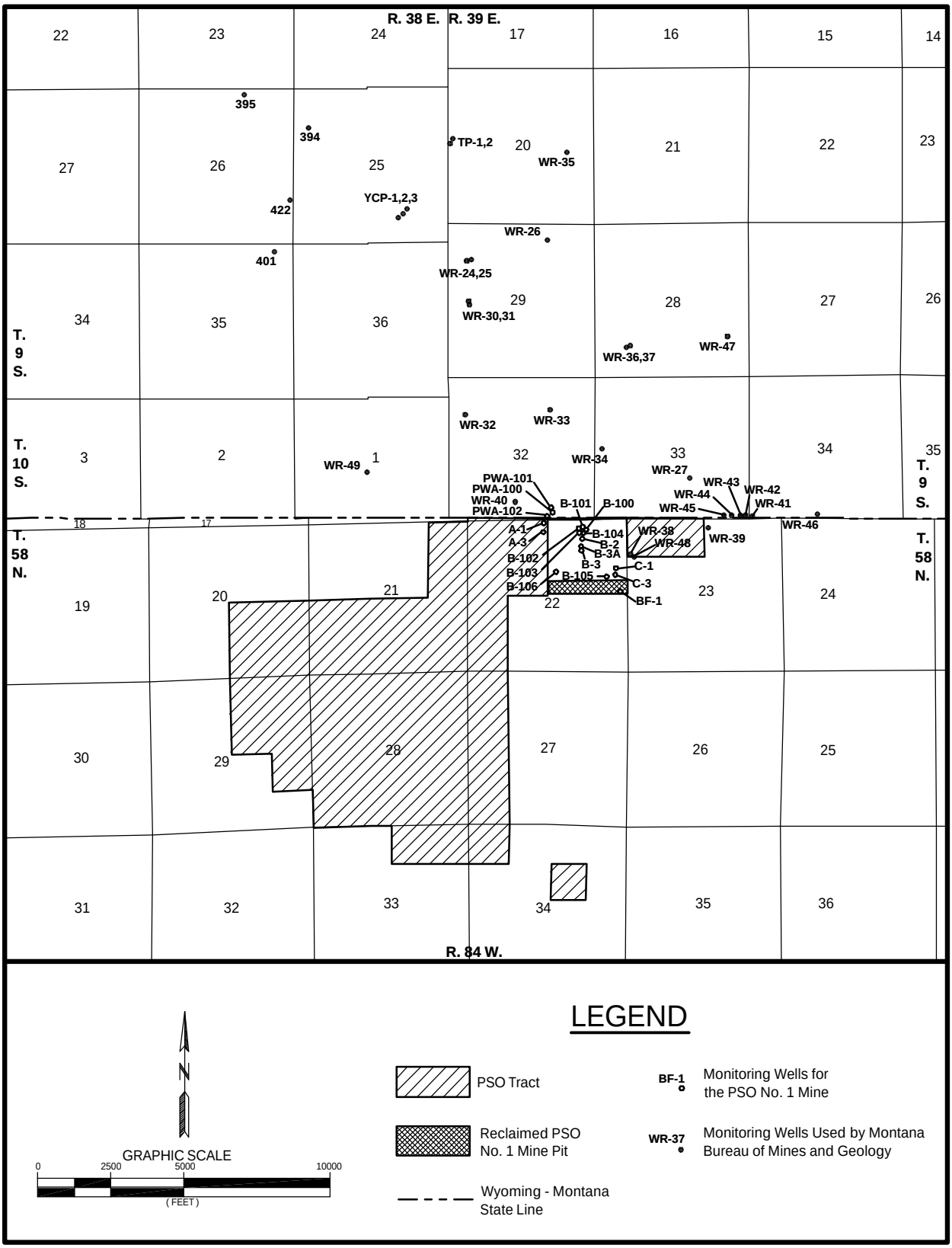


Figure 3-9. Monitoring Well Locations Within and Adjacent to the PSO Tract.

Table 3-9. Existing Acid Neutralizing Capacity in Sensitive Lakes.

Wilderness Area	Lake	Background ANC (Peq/L)
Bridger	Black Joe	69.0
	Deep	61.0
	Hobbs	68.0
	Upper Frozen	5.8[1]
Cloud Peak	Emerald	55.3
	Florence	32.7
Fitzpatrick	Ross	61.4
Popo Agie	Lower Saddlebag	55.5

[1] Since the background ANC value is less than 25 Peq/L, the potential ANC change is expressed in Peq/L, and the applicable threshold is 1.0 Peq/L.

Source: Argonne (2002)

Mine in 1976. This was prior to most of the current regulations and guidelines governing surface coal mining in Wyoming. Most of the monitoring wells for the PSO No. 1 Mine were installed after pit development; therefore, groundwater level drawdowns had already occurred at many of the well locations when the first measurements were recorded.

The future of the PSO No. 1 Mine was contingent upon approval and construction of a proposed railroad spur for an adjacent mine in Montana that was being contemplated by Shell Oil Company. A railroad spur was not built and commercial mining did not commence, although the pit remained open until late 1995 when reclamation of the PSO No. 1 Mine site began. By mid-1996, reclamation was complete and a single backfill monitoring well was then installed. Data from the PSO No. 1 Mine's 18 monitoring wells, as well as data collected by MBMG to identify the hydrogeology of the adjacent proposed surface coal mine area in Montana (Hedges et al. 1980), were used to prepare the following description of the baseline groundwater conditions in the PSO Tract area. Figure 3-9 shows the locations of the PSO No. 1 Mine pit and the MBMG monitoring wells as well as the 18 PSO No. 1 Mine monitoring wells.

Recent Alluvium

Within the boundary of the federal coal being considered for exchange, alluvium is present along West Branch. Little Youngs Creek is located just north of the tract proposed for exchange and could be affected if privately owned coal adjacent to the tract is mined (Figure 2-2). The alluvium along Little Youngs Creek ranges from roughly 50 to 100 ft wide and consists of 10 to 20 ft of fine-grained clays, silts, and sands underlain by up to 35 ft of coarse sand and scoria gravel (Ash Creek Mining Company 1984). Hedges et al. (1980) reported that slightly thicker deposits of alluvium occupy the bottom of the Youngs Creek drainage where the maximum thickness of unconsolidated materials is approximately 65 ft. Alluvial deposits along West Branch are not

extensive and were not intensively investigated for the baseline hydrology section of the PSO No. 1 Mine permit application.

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

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

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

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

Clinker

Another geologic unit consisting of sediments that were baked, fused, and melted in place is clinker, also called scoria, or burn. The clinker is the result of prehistoric coal fires that heated the rock overlying the burning coal beds and produced the clinker, which collapsed into the void left by the burned coal. Scoria deposits can be a very permeable aquifer and can extend laterally for miles in the PRB. Scoria deposits occur within the PSO Tract area. The hydrologic function of scoria in the general area is to provide infiltration of precipitation and recharge to laterally contiguous Dietz 1 and Dietz 3 coal seams.

Dietz 1 and Dietz 3 Coal Seams

Due to their lateral continuity, the Dietz 1 and Dietz 3 coal seams are

considered regional aquifers within this area of the PRB, although both are somewhat low yielding. Within the PSO Tract area, the Dietz 1 coal seam is present over a wide range of depths below the surface (approximately one to 275 ft), and due to erosion and burning it occurs as a 20-ft thick seam only in the northern half of Sections 21, 22, and 23, T.58N., R.84W. The Dietz 2 and Dietz 3 seams have an interburden thickness ranging from approximately 20 to 40 ft. The Dietz 2 seam is present only in the southern part of the PSO Tract area and is less than five ft thick. Therefore, the Dietz 2 is not considered mineable, nor is it considered an aquifer in this area. The Dietz 3 seam is present across the entire general area and ranges from approximately 10 to 50 ft thick.

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

The hydraulic properties of the coal seams within and adjacent to the PSO Tract are expected to be very similar to those that were determined by aquifer pump testing some of the monitoring wells shown in Figure 3-9. The hydraulic conductivity of the Dietz 1 and Dietz 3 coal seams ranges from 0.13 to 3.6 ft/day. The average hydraulic conductivity for the coal bed aquifers is estimated to be 1.0 ft/day (Hedges et al. 1980). The average storage coefficient value was determined to be roughly 0.0003, indicative of a confined aquifer and typical for Fort Union coal seams that are usually overlain and underlain by relatively impermeable siltstone and shale strata. These values agree well with those measured at other surface mining operations in this general area of the PRB.

Prior to mining, the direction of groundwater flow within a coal aquifer is generally from the recharge areas near the outcrop and burn zones downgradient following

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

The Dietz 1 seam receives recharge primarily via clinker along the coal's burned outcrop areas and in places where subcrops of the coal lie beneath the water table in alluvium along watercourses. Discharge from the system ultimately occurs primarily along the Tongue River east-northeast of the PSO Tract area. As discussed in Section 3.4.3, two northeast-trending structural faults approximate the northwest and southeast boundaries of the proposed mining area. These faults, which are shown in Figure 3-10, act to control the groundwater flow patterns. This is because the coal bed is offset an estimated 60 to 180 ft across the faults, and these stratigraphic offsets act as barriers to groundwater flow. Therefore, the Dietz 1 coal is not continuous to the west or south and essentially no recharge west or south of the PSO Tract area can occur. The subcrop zone lies beneath the alluvium of the West Branch and Little Youngs Creek and the seam is saturated downdip to the northeast indicating the alluvial subcrop is a source of recharge. Discharge from the Dietz 1 coal aquifer occurs mostly at the seam's subcrops beneath the Tongue River valley to the east-northeast of the PSO Tract area.

The Dietz 3 seam is burned over broad areas north, south, and west of the PSO Tract area (Figure 3-10). The structurally and topographically high outcrops of scoria there are the primary recharge areas. The Dietz 3 seam is also offset by the faults that approximate the northwest and southeast boundaries of the proposed mining area. As shown in Figure 3-10, the Dietz 3 coal outcrop is located along the north side of Ash Creek valley. As a result, the Dietz 3 coal is not continuous to the northwest, southwest, or southeast of the PSO Tract area. Discharge from the Dietz 3 coal aquifer occurs mostly at the seam's subcrops beneath the Tongue River valley to the east-northeast of the PSO Tract area.

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

Site-specific water level data collected at monitoring wells shown in Figure 3-9 indicate that opening the PSO No. 1 Mine box cut pit in 1976 caused groundwater level drawdowns to occur locally in both the Dietz 1 and Dietz 3 coal seams due to pit dewatering, although the general flow direction remained toward the northeast, down the structural gradient. The pit penetrated through the Dietz 1 coal in 1976. This coal seam is dry near the pit, but monitoring wells located north of the pit which do have water in them recorded drawdowns. Currently, groundwater flow in the Dietz 1 seam is still toward the pit and this should continue until the

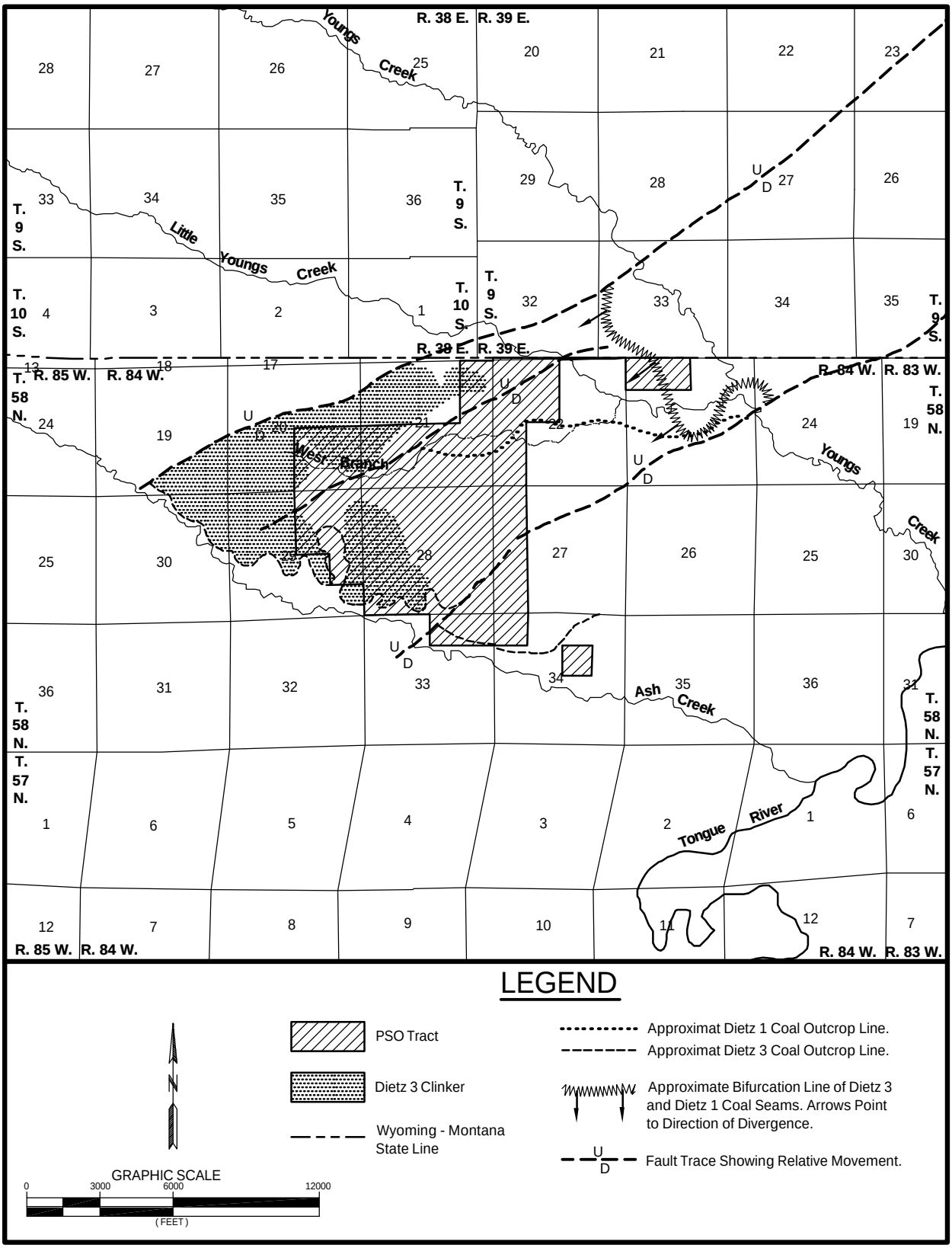


Figure 3-10. General Geologic Map of the PSO Tract Area.

backfill fully saturates and equilibrium is reestablished.

Recovery has proceeded rapidly since reclamation occurred. The PSO No. 1 Mine pit partially removed the shale interburden between the Dietz 1 and Dietz 3 seams. As a result, groundwater from the Dietz 3 seam migrated through this confining layer upward into the excavation, thus lowering the Dietz 3 seam's hydrostatic pressure. Reclamation has apparently stopped the upward leakage, as groundwater level elevations have been quickly increasing (P&M 2001). Current groundwater level information suggest that recent nearby CBM activity may influence the rate at which premining groundwater level equilibrium will be reached.

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

Sub-Dietz Coal Fort Union Formation

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

In the vicinity of the PSO Tract area the hydrologic units stratigraphically beneath the Dietz 3 coal seam

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

Lance and Fox Hills Formations

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

3.4.6.2 Surface Water

The area surrounding the PSO Tract consists of relatively flat, rounded uplands dissected by numerous deep, steeply sloping ravines. In general, the streams within this area are typical for the region, and their flow events are closely reflective of precipitation patterns. Flows would be expected to vary widely on a seasonal and annual basis. Flow events frequently result from snowmelt during the late winter and early spring. Although peak discharges from such events are generally small, the duration and therefore percentage of annual runoff volume can be considerable. Perhaps as much as 60 to 80 percent of the annual streamflow volume would be expected to result from spring snowmelt runoff. During the spring, general storms (both rain and snow) increase soil moisture, hence decreasing infiltration capacity, and subsequent rainstorms can result in both large runoff volumes and high peak discharges. The surface water quality varies with streamflow rate; the higher the flow rate, the lower the TDS concentration but the higher the suspended solids concentration. Surface water features within and adjacent to the PSO Tract are displayed in Figure 3-11.

Surface water drainages within and adjacent to the PSO Tract area include Youngs Creek, Little Youngs Creek, West Branch, and Ash Creek. Youngs Creek, Little Youngs Creek, and Ash Creek are perennial streams. The streams of primary interest are the main stems of Little Youngs Creek and its ephemeral tributary, West Branch. Little Youngs Creek is a tributary to Youngs Creek, which is a tributary to Tongue River. Little Youngs Creek flows in an east-southeast direction towards its confluence with Youngs Creek, and West Branch flows eastward toward its confluence with Little Youngs Creek (Figure 3-11). The PSO Tract area lies within the drainages of Youngs Creek and Ash Creek; however, the main stems of these two streams do not fall within the boundary of the federal coal being considered for exchange. West Branch lies within the PSO Tract. The relationship between the area of the federal coal being considered for exchange and

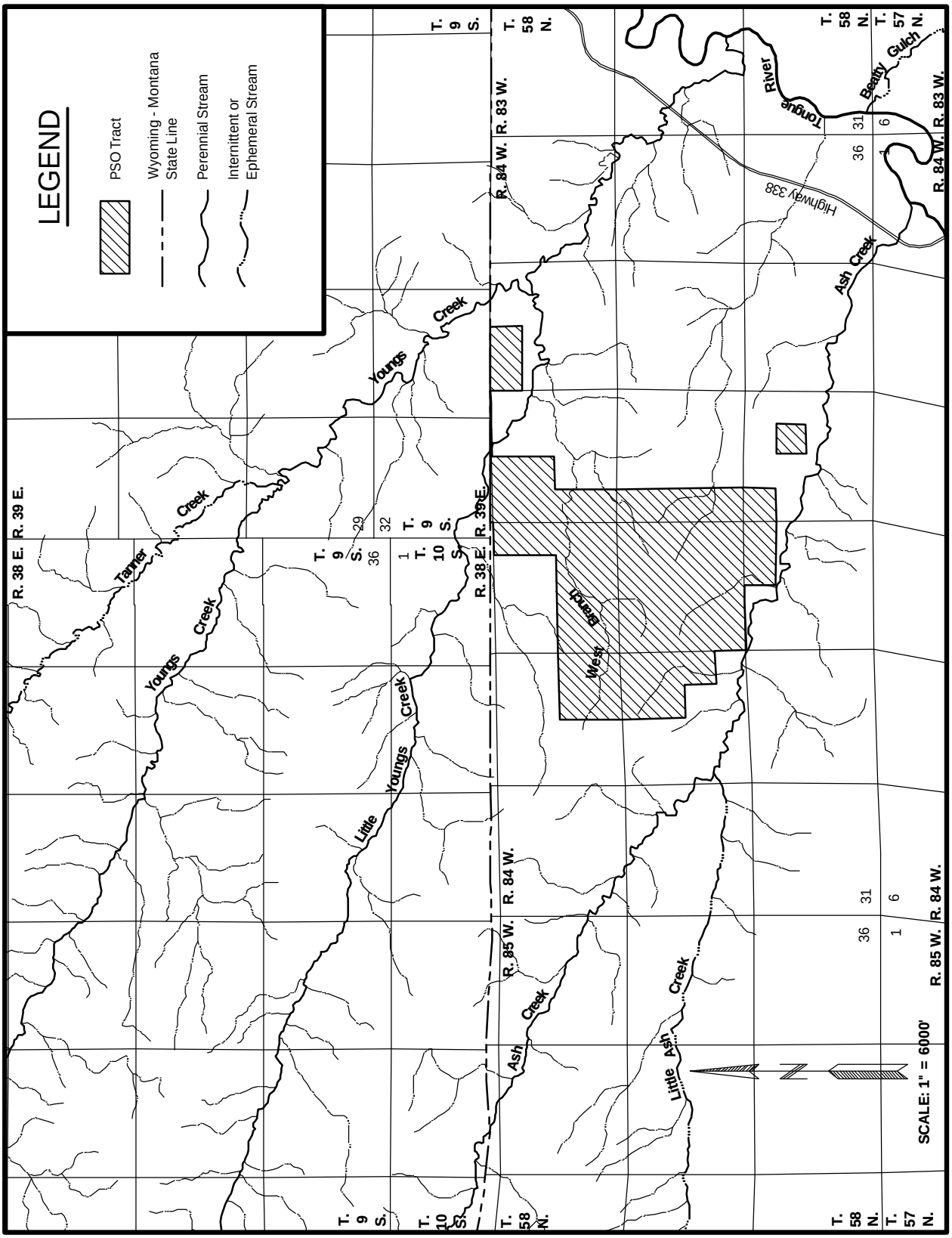


Figure 3-11. Surface Water Features Within and Adjacent to the PSO Tract.

the area of the proposed Ash Creek Mine, which includes privately-owned coal adjacent to the PSO Tract, is shown on Figure 2-2. As shown in Figure 2-2, portions of Little Youngs Creek and Youngs Creek could be affected by mining privately-owned coal adjacent to the PSO Tract, if the exchange is completed and PSO opens a mine as proposed.

Little Youngs Creek originates in the Wolf Mountains in Montana. Only about 22 percent of its drainage area is situated within the State of Wyoming. The drainage area of Little Youngs Creek above the state line is approximately 13.8 square mi. Little Youngs Creek streamflow varies with the seasons and is further affected by stream diversions for stock reservoirs and irrigation withdrawals, as well as irrigation return flows. During the low-flow season, streamflow is maintained largely by groundwater seepage from the alluvial system (Hedges et al. 1980). Based primarily upon long-term observations by local residents, Little Youngs Creek would be classified as a perennial stream, particularly throughout its lower reaches. These observations also indicate that the natural base flow is very small, probably only a fraction of one cfs during the low-flow season. During the driest years there may be periods of time when there is no streamflow. A streamflow monitoring station located about one-half mile upstream of the state line was maintained by Shell Oil Company for portions of the 1980 through 1982 water years, and records from that station indicate that the stream was dry for prolonged periods of time during the low-flow season (Ash Creek Mining Company 1984).

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

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

In 1975, prior to any mining activities at the PSO No. 1 Mine, water samples were collected from Little Youngs Creek and West Branch to document baseline surface water quality in the general vicinity of the mine site (Ash Creek Mining Company 1984). Local

surface waters were characterized as moderately alkaline, very hard, and slightly turbid. Calcium and magnesium were the predominant cations while bicarbonate and sulfate were the major anions. The SAR was less than 1.0, indicating that the water is suitable for irrigation on all types of soils. Concentrations of nutrients were low indicating that upstream input of organic materials does not occur; however, relatively high fecal coliform bacteria values indicated that either domestic or animal wastes were entering the streams upstream from the mine. Surface water quality is usually unsuitable for domestic uses without treatment, but suitable for most agricultural uses, livestock, and wildlife.

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

3.4.6.3 Water Rights

Records of the Wyoming SEO and the Montana DNRC were searched in March 2003 for groundwater rights within a three-mile radius of the federal coal lands being considered for exchange. This information would be required for a WDEQ mine permit application. SEO and DNRC data indicate there are 516 permitted water wells within three miles of the federal coal being considered for exchange, of which 500 are within Wyoming and 16 are within Montana. Of the 500 permitted wells in Wyoming, 85 are related to surface coal mining. There are 37 mine-related monitoring wells in Montana, although the DNRC does not require a Certificate of Water Right for scientific monitoring wells, as there is no beneficial use of water. Of the 431 other wells in Wyoming and Montana that are not related to surface coal mining, 38 are permitted for stock watering, 16 are permitted for domestic use, 18 are permitted for stock watering and domestic use, 224 are permitted for both CBM development and stock watering, 58 are permitted for CBM development only, 71 are permitted for both irrigation and CBM development, three are permitted for stock, miscellaneous, and CBM development, two are permitted for miscellaneous, and one is permitted for stock and irrigation use. In addition, a total of 67 CBM wells currently exist in Montana that are within a three-mile radius of the federal coal being considered for exchange. Similar to monitoring wells, the State of Montana has ruled that a Certificate of Water Right is not required for a CBM well unless the discharge water is put to a beneficial use (i.e., stock watering). A listing of the 431 permitted wells that are not related to mining is presented in Appendix G.

Wyoming SEO and Montana DNRC records were also searched for

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

3.4.7 Alluvial Valley Floors

WDEQ regulations define AVFs as unconsolidated stream laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Prior to leasing and mining, AVFs must be identified because SMCRA restricts mining activities which affect AVFs that are determined to be significant to agriculture. In accordance with 30 CFR 822.12, impacts to designated AVFs are prohibited 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 the essential hydrologic functions of the AVF must be reestablished as part of the reclamation process. The determination of significance to agriculture is made by WDEQ/LQD, and it is based on specific calculations related to the production of crops or forage on the AVF and the size of the existing agricultural operations on the land of which the AVF is a part.

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

Three essential hydrologic functions were identified for restoration during the reclamation of the Ash Creek Mine: channel stability, alluvial underflow, and flood irrigation. These three essential hydrologic functions were reestablished upon the mine's final reclamation. Because the PSO No. 1 Mine's pit did not disturb the majority of alluvial valley fill on Little Youngs Creek, groundwater underflow through the alluvium was not

significantly changed. Irrigation ditches that were disturbed but had been neglected several years prior to disturbance were renovated, thus reestablishing the potential for flood irrigation. Reclaimed channels were constructed to safely convey the probable discharges at non-erosive velocities, thus reestablishing channel stability.

If P&M acquires the federal coal in the PSO Tract as proposed and applies for a permit to mine, the mine permit application submitted to WDEQ must include an investigation determining the presence of AVFs within the proposed permit area. As depicted by the schematic mine plan for P&M's proposed Ash Creek Mine (Figure 2-2), portions of West Branch, Little Youngs Creek, and Youngs Creek would be within the permit area. West Branch is within the PSO Tract. Little Youngs Creek and Youngs Creek are outside of the PSO Tract but would be disturbed if the privately-owned coal adjacent to the PSO Tract is mined as shown in Figure 2-2. Ash Creek and its alluvial valley would be outside of the mined areas; therefore, it is unlikely that AVF investigations of the Ash Creek valley would be necessary. Specific declarations of the presence of AVFs and their significance to agriculture within the proposed Ash Creek Mine permit area would be made by WDEQ.

3.4.8 Wetlands

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

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

General jurisdictional wetland inventories were completed in 2001 on the federal coal lands considered for exchange. Formal inventories would be completed and submitted to the COE as a required part of the mine permit application. The wetland delineations are completed in accordance with the procedures

and criteria contained in the COE 1987 Wetland Delineation Manual. A total of 15.32 acres of waters of the U.S. have been identified, of which 6.20 acres are estimated to be jurisdictional wetlands. The remaining 9.12 acres are classified as other waters of the U.S. The 6.20 acres of wetlands are associated primarily with man-made stock ponds while the 9.12 acres of other waters are associated with stockponds (6.3 acres) and ephemeral stream channels (2.82 acres).

3.4.9 Vegetation

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

A total of three vegetation types have been identified and mapped within the PSO Tract. Table 3-10 presents the acreage and percent of the area encompassed by each vegetation type within the PSO Tract. The vegetation types include Mixed Shrub Grass, Ponderosa Pine, and Rough Breaks. These vegetation types are described as follows:

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

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

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

Table 3-10. Vegetation Types Identified and Mapped Within the PSO Tract.

Vegetation Type	Acres	Percent of Area
Mixed Shrub Grass	1592.1	77.85
Ponderosa Pine	330.8	16.18
Rough Breaks	122.1	5.97
Total	2,045.0	100.00

western wheatgrass, and needle-and-thread.

3.4.9.1 Threatened, Endangered, Proposed, and Candidate Plant Species, BLM Sensitive Species, and State Species of Special Concern

Refer to Appendix E.

3.4.10 Wildlife

3.4.10.1 Wildlife Resources

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

Wildlife monitoring has been ongoing for the P&M Ash Creek Mine since the mine was permitted. The program was designed to meet the WDEQ/LQD and federal requirements for the annual monitoring and reporting of wildlife activity on coal mining areas. Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The annual monitoring studies for a mine permit area of this size (less than 500 acres) involve the measurement and assessment of selected wildlife species, and studies are not as detailed as baseline inventories or monitoring programs for larger mines. The monitoring program has continued in accordance with Appendix B of the WDEQ/LQD Rules and Regulations. For the Ash Creek Mine, all wildlife species coincidentally observed during wildlife surveys are recorded. Any signs of species that are not visually sighted are also recorded.

The most recent annual wildlife monitoring program for the P&M Ash Creek Mine was conducted by Intermountain Resources of Laramie, Wyoming and the results are included in the 2002 *Ash Creek Mine Annual Mining and Reclamation Report*, which was submitted to the WDEQ/LQD (P&M 2002). Some of the 2003 surveys have been conducted but the results of those surveys are not yet available.

Baseline and monitoring surveys cover large perimeters around each mine's permit area. Consequently, a majority of the PSO Tract area has been surveyed during annual wildlife monitoring for the P&M Ash Creek Mine by Intermountain Resources. In addition, the entire PSO Tract area has undergone a

wildlife survey, which was completed in July of 2000 through July of 2001 by Intermountain Resources.

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

3.4.10.2 Big Game

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

Pronghorn are, by far, the most common big game species in the area. The study area is within the Clearmont Herd Unit with approximately 1,000 acres within yearlong range and the remaining 1,045 acres within winter-yearlong range. None of the study area or other areas within two miles have been classified as crucial or critical pronghorn habitat. The yearly big game monitoring surveys completed for the adjacent P&M Ash Creek Mine also covered a majority of the proposed exchange area. The Ash Creek Mine surveys indicated that pronghorn are not abundant on the area during the spring, summer, or fall but frequent the site in normal winters and move out of the area in harsh winters when deep snows accumulate on the site.

The PSO Tract area is located within the northeastern portion of the WGFD North Bighorn Mule Deer Herd Unit. The WGFD maps show the PSO Tract area is totally within winter-yearlong mule deer range. Crucial or critical mule deer ranges do not occur on or within several miles of the PSO Tract area. The P&M Ash Creek Mine survey indicated the area is a yearlong use area and mule deer are scattered throughout the site and do not concentrate on the area during any particular season.

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

tailed deer range exists on or within several miles of the PSO Tract area.

3.4.10.3 Other Mammals

A variety of small and medium-sized mammal species occur in the vicinity of the PSO Tract area. These include predators and furbearers, such as coyote (*Canis latrans*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*). Prey species include rodents such as mice, voles, chipmunks, and black-tailed prairie dogs (*Cynomys ludovicianus*), and lagomorphs (jackrabbits and cottontails). These species are cyclically common and widespread throughout the region. They are important prey items for raptors and other predators. Surveys for prairie dog towns were conducted on the PSO Tract area and adjacent lands. Several small prairie dog towns were observed on the PSO Tract area. These prairie dog towns are located in the NE¼ of Section 21, the NW¼ of Section 22, the SE¼ of Section 20, the NE¼ of Section 29, and the NW¼ of Section 27, T.58N., R.84N. (Figure 3-12). Several other prairie dog towns are known to exist within several miles of the PSO Tract area (see additional discussion in Appendix E).

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

3.4.10.4 Raptors

Numerous raptor species have been observed on or adjacent to the PSO Tract area. These species include the golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), Swainson's hawk (*Buteo swainsoni*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), rough-legged hawk (*Buteo lagopus*), prairie falcon (*Falco mexicanus*), Cooper's hawk (*Accipiter cooperii*), American kestrel (*Falco sparverius*), turkey vulture (*Carthartes aura*), great horned owl (*Bubo virginianus*), short-eared owl (*Asio flammeus*), and burrowing owl (*Athene cunicularia*). Figure 3-12 shows the locations of intact raptor nest sites that have been identified since monitoring began for PSO No. 1/P&M Ash Creek Mine, which includes most of the PSO Tract area. A total of six raptor species have been identified nesting within one mile of the PSO Tract area. These species include the great horned owl, red-tailed hawk, golden eagle, prairie falcon, Cooper's hawk, and American kestrel. In 2001, six nest sites were active and included two golden eagle nests, three red-tailed hawk nests, and one great horned owl nest. An undetermined number of American kestrel nests were active.

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

3.4.10.5 Game Birds

Several upland game bird species have been observed on the PSO Tract area or adjacent lands, including sage grouse (*Centrocercus*

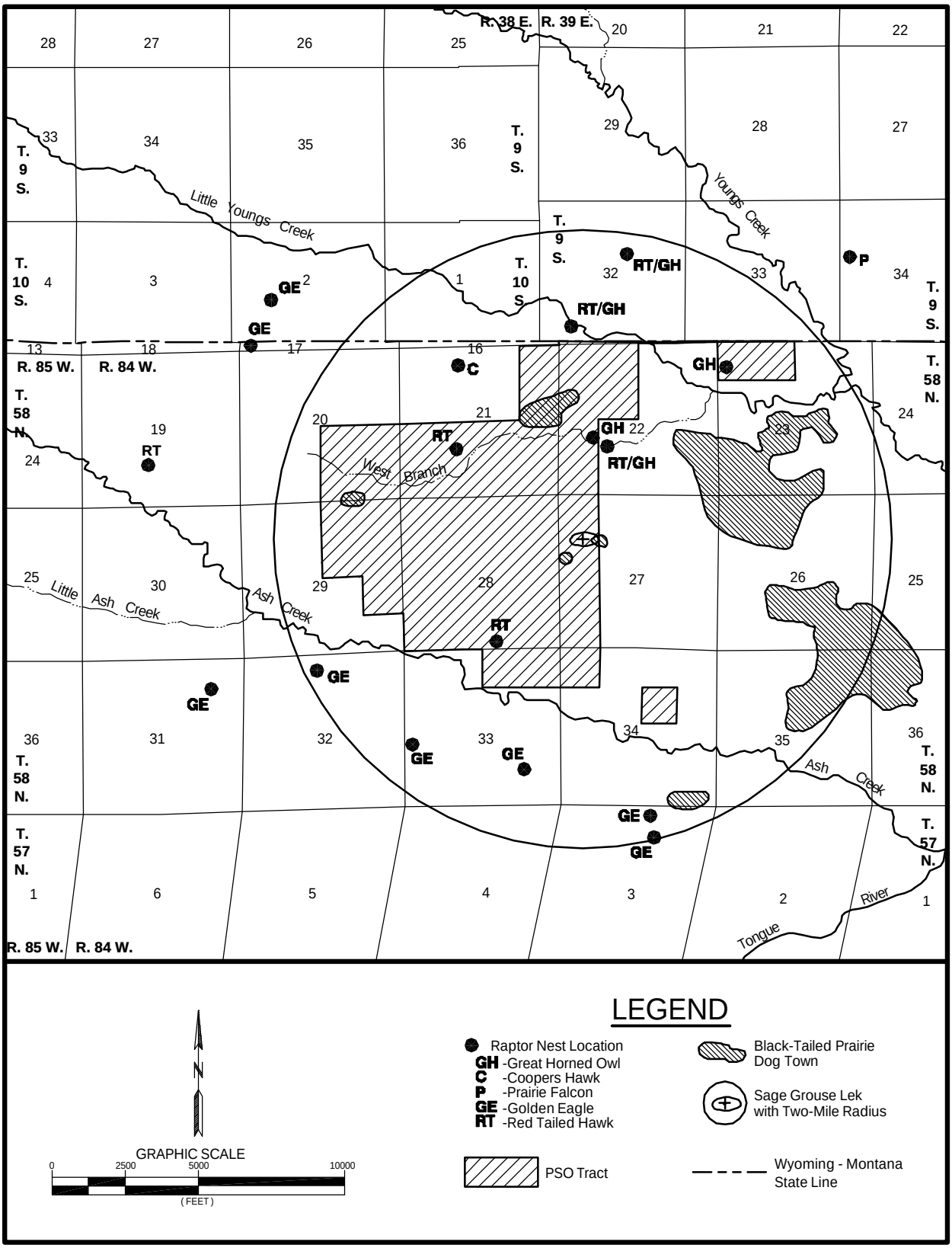


Figure 3-12. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the PSO Tract.

urophasianus), sharp-tailed grouse (*Tympanuchus phasianellus*), migratory mourning doves (*Zenaida macroura*), wild turkey (*Meleagris gallopavo*), pheasant (*Phasianus colchicus*), and gray partridge (*Perdix perdix*). The mourning dove only inhabits the area for breeding and reproduction from late spring to early fall.

The sage grouse is a yearlong resident and has been found on the PSO Tract area. Sage grouse lek surveys in April and May of 2001 and in March and April of 2002 identified an active sage grouse strutting ground within the federal coal lands being considered for trade. Figure 3-12 shows the location of this active lek. The two-mile radius from this lek, which research identified as the area in which most hens would nest, covers most of the federal coal lands being considered for trade. The lek is located in the NW¼ of Section 27, T.58N., R.84W. This particular lek has been surveyed by Intermountain Resources since 1979 as part of the annual wildlife monitoring program for the Ash Creek Mine and the results have been submitted to WDEQ/LQD in the *Ash Creek Mine Annual Mining and Reclamation Report*. This sage grouse lek has been active intermittently since 1979, with the maximum number of males recorded at 31 in 1982. Survey data from 1987 through 1996 indicated that the lek had been abandoned. During the March and April 2002 survey, a maximum of 18 strutting males was recorded, approximately the same number that was recorded in 2001. The lek was most recently surveyed in 2003, but the results of that survey are not yet available.

The sharp-tailed grouse is a yearlong resident and was also found on the PSO Tract. Several sharp-tailed grouse lek sites have been recorded in the past but these leks were inconsistently used and none were consistently active in 2001 and 2002.

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

3.4.10.6 Migratory Bird Species of Management Concern in Wyoming

Table 3-11 provides a list of the 40 Migratory Bird Species of Management Concern in Wyoming that the USFWS will use exclusively for reviews concerning existing and proposed coal mine leased land (USFWS 2002a). This listing was taken directly from the Wyoming Bird Conservation Plan (Cerovski et al. 2000). The regional status and expected occurrence, historical observations, and breeding records on and near the PSO Tract for each listed species are included in Table 3-11. Of the 40 species listed in Table 3-11, 13 species have historically been observed within the PSO Tract area. The species commonly observed nesting in the area include the greater sage-grouse, Brewer's sparrow, lark bunting, loggerhead shrike, vesper sparrow, and lark sparrow. The ferruginous hawk, Swainson's hawk, long-billed curlew, burrowing owl, upland sandpiper, and black-billed

Table 3-11. 40 Migratory Bird Species of Management Concern in Wyoming for Coal Mines: Their Regional Status, and Expected and Actual Occurrence on or Near the PSO Tract.

Species	Seasonal Status/Breeding Records in Northeastern WY[1]	Expected Occurrence on and in Vicinity of the PSO Tract[2]	Historical Sighting Records and Breeding Status in Vicinity of the PSO Tract[3]
LEVEL I (species need conservation action)			
Mountain plover	Summer/Breeder	Rare	None
Greater sage-grouse*	Resident/Breeder	Common	Common/Breeder
McCown's longspur	Summer/Breeder	Common	None
Baird's sparrow	Summer/Observed	Uncommon	None
Ferruginous hawk*	Summer/Breeder	Common	Occasional
Brewer's sparrow*	Summer/Breeder	Common	Common/Breeder
Sage sparrow	Summer/Breeder	Uncommon	None
Swainson's hawk*	Summer/Breeder	Common	Occasional
Long-billed curlew*	Summer/Observed	Uncommon	Few sightings
Short-eared owl	Summer/Breeder	Common	None
Peregrine falcon	Resident/Observed	Uncommon Migrant	None
Burrowing owl*	Summer/Breeder	Uncommon	Few sightings, Breeder
Bald eagle*	Resident/Breeder	Seasonally Common	Frequent in winter
Upland sandpiper*	Summer/Breeder	Uncommon	Uncommon/Breeder
LEVEL II (species need monitoring)			
Cassin's kingbird	Never Recorded	Rare	None
Lark bunting*	Summer/Breeder	Common	Common/Breeder
Dickcissel	Summer/Observed	Uncommon	None
Chestnut-collared longspur	Summer/Breeder	Uncommon	None
Black-chinned Hummingbird	Never Recorded	Rare	None
Pygmy nuthatch	Never Recorded	Rare	None
Marsh wren	Never Recorded	Rare	None
Western bluebird	Summer/Breeder	Uncommon	None
Sage thrasher	Summer/Breeder	Uncommon	None
Grasshopper sparrow	Summer/Breeder	Uncommon	None
Bobolink	Summer/Observed	Uncommon	None
Common loon	Summer/Observed	Uncommon	None
Black-billed cuckoo*	Never Recorded	Uncommon	Few sightings
Red-headed woodpecker	Summer/Breeder	Uncommon	None
Yellow-billed cuckoo	Summer/Observed	Rare	None
Eastern screech-owl	Never Recorded	Rare	None
Western screech-owl	Never Recorded	Rare	None
Western scrub-jay	Never Recorded	Rare	None
Loggerhead shrike*	Summer/Breeder	Common	Occasional/Breeder
Vesper sparrow*	Summer/Breeder	Common	Common/Breeder
Lark sparrow*	Summer/Breeder	Common	Common/Breeder
Ash-throated flycatcher	Summer/Observed	Rare	None
Bushtit	Never Recorded	Rare	None
Merlin	Resident/Observed	Uncommon	None
Sprague's pipit	Never Recorded	Uncommon Migrant	None
Barn owl	Summer/Observed	Very Rare	None

1 Compiled from Luce, et al. (1999), for Sheridan County.
2 Expected occurrence in the study area was based on range, history of occurrence, and habitat availability.
3 Sighting records were derived from actual occurrence on or within one-half mile of the PSO Tract.
* Species marked with an asterisk have historically been recorded during baseline or monitoring surveys for the Ash Creek Mine.

cuckoo have not been recorded nesting on the PSO Tract but were observed as transients in the area.

The bald eagle is seasonally common and most frequently observed during the winter months. The burrowing owl is uncommon and classified as a potential breeder in the PSO Tract area. Sage grouse (greater sage-grouse), recently added to the Level I list, is common in the PSO Tract area and is classified as a common breeder (see Section 3.4.10.5). Cited as the potential limiting factor, suitable nesting habitat is scarce if not absent in the PSO Tract area for many of the Migratory Bird Species of Management Concern in Wyoming. The other species that are listed in Table 3-11 have rarely or never been recorded in the PSO Tract area.

3.4.10.7 Other Species

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

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

would use the isolated ponds and drainages filled by the CBM wells if sufficient water is established.

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

3.4.10.8 Threatened, Endangered, Proposed, and Candidate Animal Species, BLM Sensitive Species, and State Species of Special Concern

Refer to Appendix E.

3.4.11 Ownership and Use of Land

The surface ownership within the PSO Tract is shown in Figure 3-13. The surface is owned by the

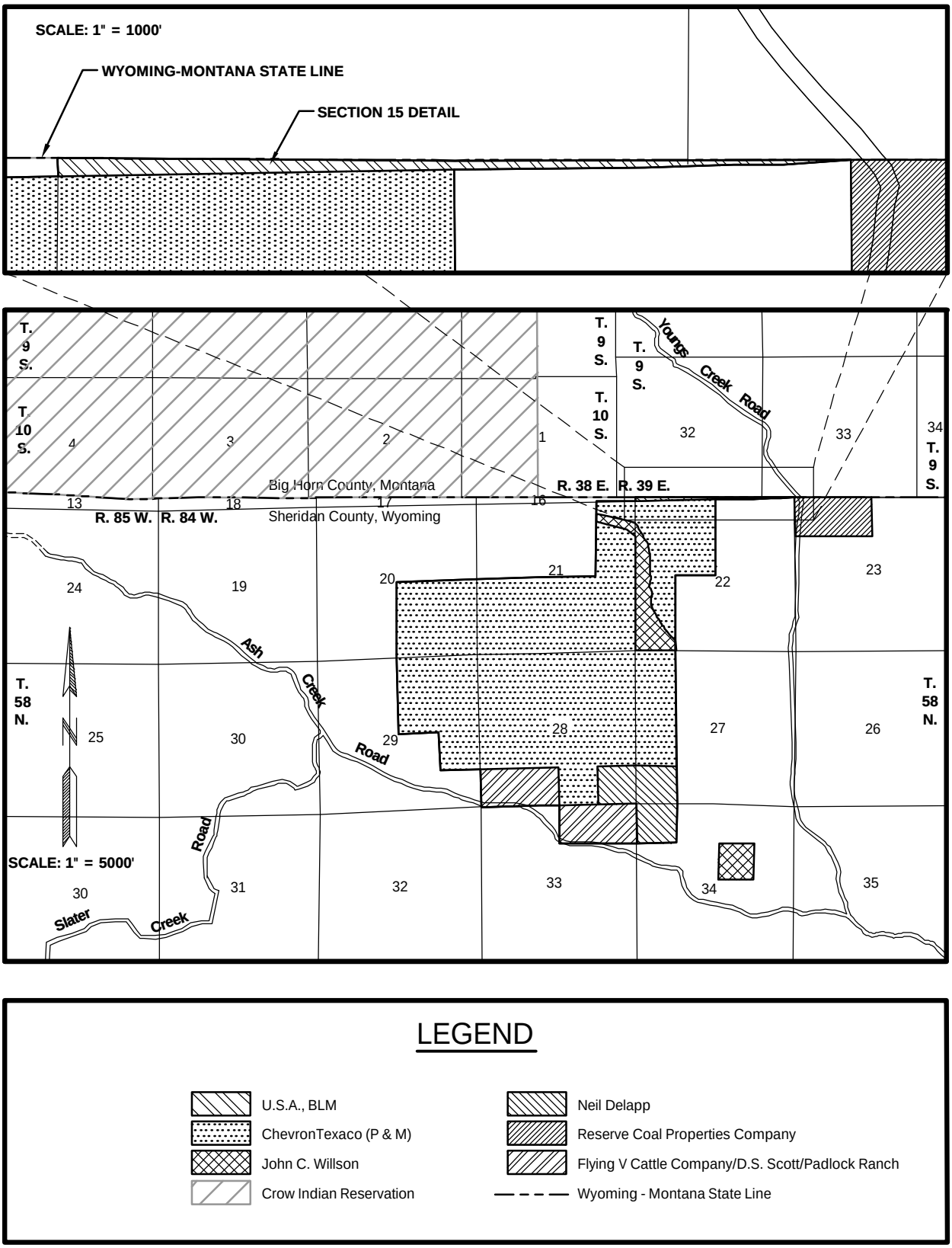


Figure 3-13. Surface Ownership Within the Boundary of the PSO Tract.

ChevronTexaco Corporation (P&M), John C. Willson, Reserve Coal Properties Company, Flying V Cattle Company / D.S. Scott / Padlock Ranch, Neil DeLapp, and the federal government. The federal government owns all of the coal estate included in the tract, but the federal surface estate, which is shown in the detail map in Figure 3-13, is 6.41 acres in Section 15, T.58N., R.84W. The principal land use within the tract is domestic grazing and wildlife habitat.

Areas of surface disturbance on the federal coal lands being considered for exchange are off road, two-track vehicle trails associated with livestock management activities and the disturbance associated with the five CBM wells that have been drilled (as of March 2003) and the potential disturbance with the 14 CBM wells that are currently permitted. The Ash Creek Road and the Youngs Creek Road, pass briefly along the edges of the federal coal lands (Figure 3-13).

The oil and gas rights within the boundary of the federal coal being considered for exchange are both federally and privately owned (Figure 3-14). The majority (about 77 percent) are private. The federally owned oil and gas rights included in the tract are leased, and a list of the lessees of record for those federal oil and gas leases is included as Table 3-12.

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

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

CBM is currently being produced within and adjacent to the PSO Tract. The approved well spacing pattern is one well per coal seam per 80 acres for development of CBM resources in the PRB. There would potentially be 78 CBM well locations on the federal coal lands being considered for exchange if all of the 80-acre spacing units within the tract are drilled and completed in all

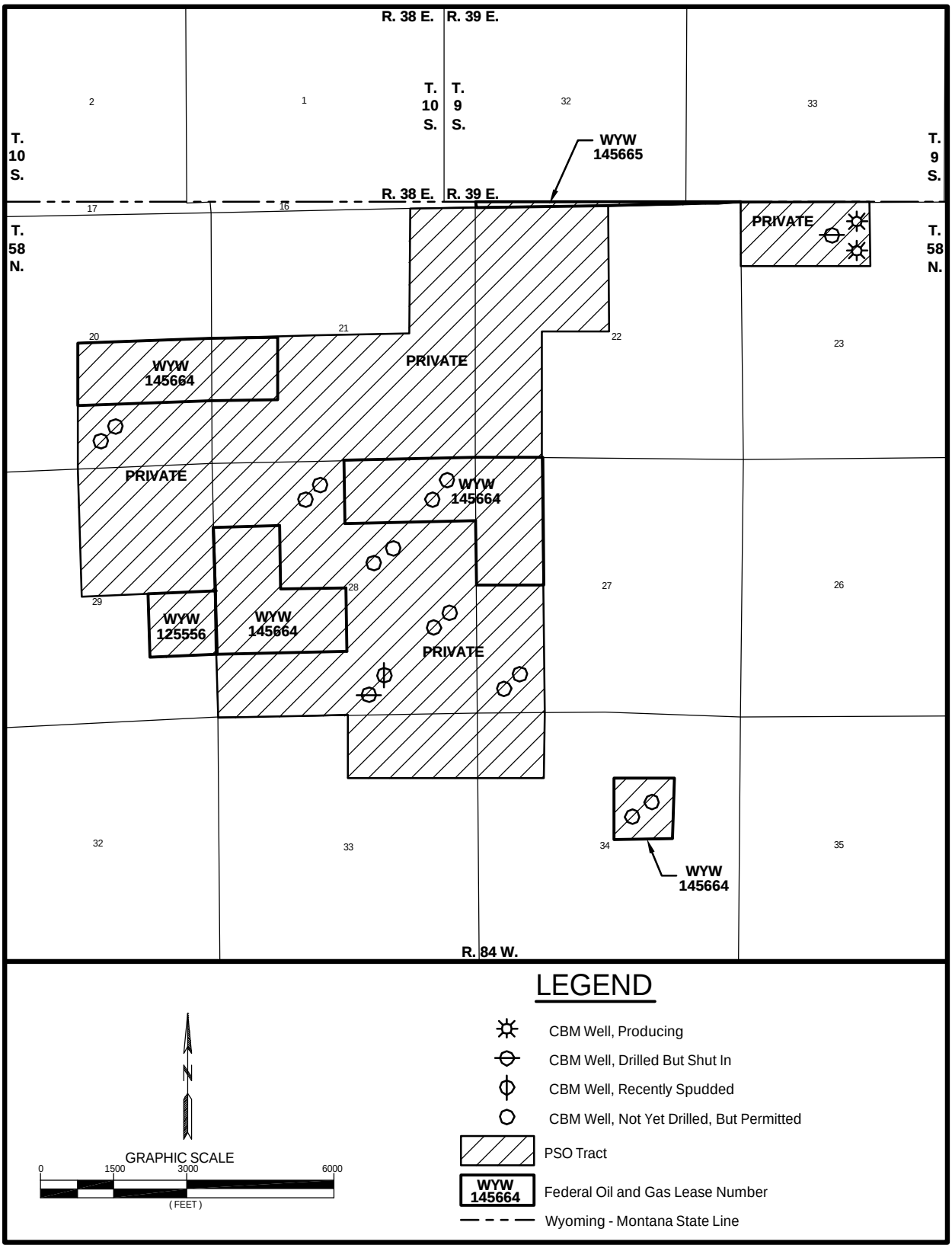


Figure 3-14. Oil and Gas Ownership Within the Boundary of the PSO Tract.

Table 3-12. Oil and Gas Ownership on the Federal Coal Lands Being Considered for Exchange.

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

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

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

of the potential coal beds. CBM development has been accelerating rapidly within and adjacent to the federal coal lands being considered for exchange since 1999. A search of the WOGCC records in March 2003 revealed that there were 191 CBM wells completed or permitted to be drilled within T.58N., R.84W and 106 of those wells were in production. At the time, five CBM wells had been drilled (two producing, two shut-in, and one spudded) and 14 additional wells have been permitted to be drilled within the boundary of the federal coal being considered for exchange (Figure 3-14). A concurrent search of the Montana BOGC revealed that there were no CBM wells drilled or permitted to be drilled within T.9S., R.38E. and T.10S., R.38E., but 67 CBM wells have been completed within three miles of the PSO Tract in T.9S., R.39E. Sixty of these 67 existing CBM wells are currently in production, four are shut in, and three are spudded. Nine more wells are permitted to be drilled in this same three-mile radius area. As CBM wells are drilled and completed on or adjacent to the PSO Tract, support facilities (i.e., powerlines, pipelines, and compressor stations) must be constructed to produce and transport the CBM and the associated produced water.

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

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

Two active surface coal mining operations in Big Horn County, Montana, the Decker Coal Mine and the Spring Creek Coal Mine, are located approximately six miles and

seven and one-half miles, respectively, northeast of the PSO Tract (Figure 3-1). The West Decker mine was opened in 1972, the East Decker mine was opened in 1977, and the Spring Creek mine was opened in 1979. Both the Decker and Spring Creek mines are currently producing around 10 to 11 million tons of coal annually (Claudia Furiof March 2003).

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

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

The surface of all of the lands within the boundary of the federal coal being considered for exchange, with the exception of the 6.41 acres in Section 15, T.58N., R.84W., is currently privately owned (Figure 3-13) and recreational use is allowed only with landowner permission. P&M does not allow sport hunting on their surface lands within the PSO Tract.

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

Specific details regarding big game herd management objectives in the project area are contained in the *Sheridan Region Annual Big Game Herd Unit Report* (WGFD 2002).

The WGFD classifies the PSO Tract as yearlong and winter-yearlong habitat for antelope with none of the tract or areas within two miles adjacent classified as crucial or critical pronghorn habitat. Big game surveys conducted for the PSO

No. 1/P&M Ash Creek Mine have indicated that pronghorn are not abundant on the area during the spring, summer, or fall, but frequent the site in normal winters and move out of the area in harsh winters when deep snow accumulates. The PSO Tract area is within pronghorn antelope Hunt Area 15, which is contained in the WGFD Clearmont Pronghorn Antelope Herd Unit.

The Clearmont Herd is not a distinct unit as antelope are able to move in and out between Wyoming and Montana, as well as neighboring herd units to the south and east. The post-season population management objective for this herd was set in 1983 at 3,000 pronghorn. While the population is currently estimated to be above this objective, it is still below historic levels. The herd suffered substantial losses during the 1993-94 and 1996-97 winters, accompanied by poor fawn production and adult recruitment in 1994, 1997, and 2001. Favorable environmental conditions and improved fawn production during 1998 through 2000 resulted in an increased population. Nevertheless, WGFD personnel, hunters, and landowners have noticed a decline in the actual number of antelope over the past decade. Landowners and hunters have expressed a desire for more antelope in this herd unit. The desired level does not necessarily correspond to the established post-season population management objective, but is indicative of landowner preference for or tolerance or pronghorn. Landowners have restricted hunter access on their own due to decreased population levels. Most of the herd unit is private land (87 percent) with limited hunter access opportunities. Most landowners who allow hunting either charge access fees or lease their property for hunting. As a result there has been a steady decline in the number of resident hunters, as they are often reluctant to pay access fees. While all 300 licenses sold for this herd unit, only 79 percent of resident license holders hunted compared to 91 percent of nonresident license holders. This suggests very restricted access for resident license holders.

In 2001, hunters experienced significantly lower success and higher effort while hunting in this herd unit. In the years 1997 – 2001, hunters on average harvested about 218 pronghorn per year, which is about 72 percent below the previous five-year mean (1991 - 1996). In 2001, an estimated 250 hunters harvested an estimated 192 antelope from this herd unit, with about 77 percent success, up slightly from 2000, but considerably below the previous five-year average of 309 antelope.

WGFD predicts that the Clearmont Herd population likely stabilized or decreased in 2002 due to the effects of drought and reduced fawn production. CBM development is occurring throughout this herd unit. Impacts are unknown at this time, although increased roads, water discharge, vegetation disturbance, and human presence could have some significant impacts to the pronghorn habitat. As of June 2002, a total of 3,795 permits had been issued for CBM wells in

Sheridan County, with 1,900 wells drilled (WGFD 2002).

The PSO Tract area is located within the northeastern portion of the WGFD North Bighorn Mule Deer Herd Unit. The WGFD maps show the federal coal lands being considered for exchange are totally within winter-yearlong mule deer range. Crucial or critical mule deer ranges do not occur on or within several miles of the PSO Tract. Big game surveys conducted for the PSO No. 1 Mine have indicated that area is a yearlong use area and mule deer are scattered throughout the site and do not concentrate on the PSO Tract area during any particular season. The PSO Tract is in mule deer Hunt Area 24, part of the North Bighorn Mule Deer Herd Unit, which also includes Hunt Areas 25, 27, 28, 50, 51, 53, and 159. The North Bighorn Mule Deer Herd Unit encompasses approximately 2,568 square miles, much of which is public land managed by the USFS and the BLM, although Hunt Area 24 contains predominantly private lands with limited hunting opportunities, especially for resident hunters. Private lands are fairly restrictive and access fees are common, resulting in high hunting pressure on public lands. A wildfire (the Thunder Child Range Fire) burned approximately 5,200 acres (roughly 4,850 acres of private land and 350 acres of public land) in Hunt Area 24 during the summer of 2001. In 2001, 1,610 mule deer were harvested from the North Bighorn Mule Deer Herd Unit by an estimated 2,736 resident and 1,666 non-resident hunters. Hunter success was 37 percent overall, down slightly from 2000. Resident hunter success (28.9 percent) was considerably less than non-resident success (49.1 percent), suggesting a decrease in deer numbers on public lands where residents generally have access to hunt.

Since 1996 the post-season population management objective for the North Bighorn Mule Deer Herd Unit has been 25,000. WGFD's 2001 post-season population estimate of 20,000 was about 20 percent below the desired objective. Management in most of the herd is to increase deer numbers, and the 2002 post-season population is estimated to increase to about 21,300 deer. Continued harvest strategies are designed to allow this population to increase toward the objective (WGFD 2002).

White-tailed deer are uncommonly observed on the PSO Tract area, which is within the WGFD Powder River White-tailed Deer Herd Unit. The site is generally considered to be out of normal white-tailed deer range, but the WGFD classified the adjacent areas associated with Ash Creek and Little Youngs Creek as yearlong habitat. No crucial white-tailed deer range exists within several miles of the PSO Tract area. The PSO Tract is in white-tailed deer Hunt Area 24, part of the Powder River White-tailed Deer Herd Unit, which encompasses a large portion of north-central Wyoming and also includes Hunt Areas 17, 19, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 163, and 169. The total area of the Powder River White-tailed Deer Herd Unit is 8,610 square miles, but only

about 880 square miles (10 percent) is considered occupied habitat. Most white-tailed deer are found along riparian areas, agricultural lands, and mountain shrub communities, the majority of which are on private lands. Private lands make up about 88 percent of the delineated occupied habitat. WGFD's management strategy for white-tailed deer is to manage numbers based on landowner tolerance and access. Urban development is a major problem with white-tailed deer management in Sheridan County. Subdivisions in Sheridan County are generally in areas currently inhabited by whitetails. In 2001, 2,300 white-tailed deer were harvested from this herd unit, a decrease of about 400 animals from 2000 by an estimated 3,116 resident and 1,176 non-resident hunters. The population management objective for this herd unit is 8,000 deer. Generally, the population of white-tailed deer has been expanding during the past several years and it is estimated that the herd has exceeded the objective by as much as 100 percent during recent years. Harvest strategies are designed to limit the growth of this herd unit, although WGFD feels that they will not be able to reduce this population to objective with only harvest (WGFD 2002).

3.4.12 Cultural Resources

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

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

Environment

The study area for heritage resources encompasses an area of approximately 3,520 acres which is privately owned by P&M. The study area is about 10 air miles north of Sheridan, Wyoming, just south of the Montana border. It is encompassed by an area about 2.25 miles north-south by 4.75 miles east-west. The study area lies within the watersheds of Ash Creek and Little Youngs Creek, both tributaries of the Tongue River. The area lies on the southern edge of what archaeologists refer to as the "Pine Breaks" region, an area which extends roughly from the Musselshell River in central Montana southeastward to the western foothills of the Black Hills.

The Pine Breaks has been distinguished from neighboring areas on the plains by its more rugged topography, a relatively abundant fuel and water supply, and by its more diverse ecology which provides a variety of opportunities for resource procurement (Fredlund 1981a). The drainages have riparian environments with a wide variety of flora. The uplands area includes patches of open grassland and ponderosa pine forest. A geological phenomenon, important to archaeology in the Pine Breaks, is the abundance of the lithic material *porcellanite*, created by underground coal fires which thermally metamorphosed surrounding shales and sandstones. Porcellanite is by far the most abundant lithic material encountered in the region and was widely used for stone tool manufacture.

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

Existing Cultural Resources Inventory

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

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

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

A comprehensive investigation of the cultural resources within the study area which surrounds and encompasses the APE has recently been completed (Ferguson and

Meyer 2001). This includes a review of cultural inventories conducted previously in the region as well as a review of pertinent literature and records on the history and prehistory of the area. A great number of cultural resource studies have taken place in the surrounding Pine Breaks Region, primarily in conjunction with coal mining. These studies, undertaken since the 1970s, include a number of inventories very near or intersecting the current study area, along with several studies conducted a few miles to the north, associated with coal mine development near Decker, Montana. Major archaeological reports from the surrounding area which contain information relevant to the context of local historic and prehistoric resources include: Brumley and Dickerson 2000; Carmichael et al. 1979; Fox 1977; Fredlund 1977, 1979, 1981b; Gregg 1977a, 1977b, 1978; Haberman 1973; Larhen 1977; Munson 1990; Munson et al. 1992; Munson and Ferguson 1998; and Taylor et al. 1984.

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

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

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

Cultural resource inventory work, in compliance with regulations

established in the 1966 National Historic Preservation Act, 36 CFR Part 800 (BLM Class III level), was conducted in the PSO Tract area, including the APE, in August 2000 (Ferguson and Meyer 2001). The pedestrian inventory covered the terrain at intervals of about 30 meters. Twenty-one sites and 14 isolated artifacts were located and recorded in the approximately 3,520 acres study area. Two prehistoric sites, 48SH1127 and 48SH1134, found during this inventory are recommended as eligible for the NRHP under Criterion D. Temporal-cultural affiliations of the recorded sites range in age from Paleoindian to Historic.

3.4.12.1 Prehistoric Resources

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

Paleoindian Period

Occupation of the Pine Breaks area has been documented as early as 9,000 years ago (Brumley and Dickerson 2000); however, on adjacent areas of the Northwestern Plains occupation extends back some 12,000 years. This initial settlement of the high steppe environment, the Paleoindian period (12,000 - 8,500 years BP/10,000 BC - 6,500 BC), is characterized by the use of large, well-made lanceolate projectile points and the hunting of large, now-extinct bison, mammoths and other large fauna. Through time the point styles changed and, with the changing climate, the subsistence strategies of the early hunters and gatherers changed as well. The earliest dated human occupation in Wyoming is the Colby site in the Big Horn Basin, which contained Clovis points in association with at least seven mammoths which dated at ca. 9,250 BC. The Hell Gap site is a stratified Paleoindian site in the North Platte drainage which dates from 9,000 BC to 5,500 BC and exhibits changing point types from Goshen through Folsom, Midland, Agate Basin, Hell Gap, Alberta, Cody, and Frederick, and ends with a point type known as Lusk. The Carter-Kerr McGee,

Agate Basin, Medicine Lodge Creek, Casper, and Sister's Hill sites and others are known Paleoindian sites in the Powder River and Bighorn Basins. Paleoindian sites are uncommon due to the passage of time and the erosional and depositional effects of various climatic changes. They are most likely to occur as out-of-context surface finds on stable landforms such as ridgetops, or deeply buried in depositional settings.

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

The Archaic Period

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

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

corner-notched point was found at site 48SH1119 during the Ferguson and Meyer (2001) study.

Prehistoric and Protohistoric Periods

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

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

Prehistoric Site Types

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

3.4.12.2 Historic Resources

Seven sites with historic components were recorded in the study area during the baseline inventory (Ferguson and Meyer 2001). The historic components are

related to homesteading or stockherding and date to the period after ca. 1900. Sites with historic components include two homesteads, two cairns, two panels of graffiti, and the remains of a log structure, or possibly a tent platform, associated with either small scale logging or stock herding. The homesteads were claimed in 1909 and 1916, and neither was occupied for more than a few years (GLO Post-1908 General Land Entry Files; States 2000). No significant historic resources occur within the proposed mine plan area.

Historic Context

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

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

While the arrival of the railroad made the 1890s a time of major change, the following decade saw even greater growth. Between 1900 and 1910 the population of the county more than tripled, from 5,122 to 16,324 (USDC, BC 1913). Coal mining boomed. In the corridor from six miles north to 15 miles northwest of Sheridan, operators opened several new mines and adjacent camps between 1903 and 1907. To carry passengers and express between Sheridan and the several coal mine camps, an electric interurban railway was built from Sheridan to Monarch, a distance of 11 miles. Completed in 1912, it lasted for 14 years until replaced by busses (Kuzara 1977). Coal mining provided income to the area's farmers. Some found occasional work at the mines or sold timber to the mines for use as props underground.

Agriculture in Sheridan County rapidly expanded from 1900 to 1910. The improved land in farms grew 70 percent, from 55,567 to 95,368 acres. Sheridan County led the state in production of wheat and barley. The harvest of wheat grew 60 percent during the decade and the output of barley tripled (USDI, Census Office 1902; USDC, BC 1913). The growth continued through the 1910s. The major

agricultural commodities consisted of livestock (cattle, sheep, and horses), feed crops (hay, oats, and barley), wheat, and sugar beets. Farmers in the study area could, with one day's round trip travel by team and wagon, easily reach the coal camps along the interurban and Burlington main line, and with a longer day on the road, get to the town of Sheridan (USDA 1925).

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

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

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

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

Mr. States recalls that when he came to this country there were almost no deer at all, as they were heavily hunted to feed the mining community of Acme, as well as the local homesteaders, who he

describes as "terribly poor". He recalled that a deer was reported in the area in 1934, and several cow hands from neighboring ranches turned out on horse back to ride out to try to see it. Merriam's turkeys, now plentiful along the creeks, were introduced in the 1950s. Logging was done on State's property in 1936 and 1937. Logs were skidded by horse team (Ferguson and Meyer 2001).

Table 3-13 summarizes the Class III cultural resource inventory of the PSO Tract study area.

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

3.4.13 Native American Consultation

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

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

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

The Northern Cheyenne Indian Reservation is located approximately 25 miles north of the PSO Tract, and the Crow Indian Reservation is located less than a mile northwest of the tract in Montana. Both groups favored this region in the Protohistoric Period. It is believed that these groups entered the area in the protohistoric period as a result of population movements and technological change. By the time of the earliest Euro-American contacts, horse dependent tribes such as Crow, Sioux, and Cheyenne dominated the region although

Table 3-13. Summary of Class III Cultural Resource Inventory of the PSO Tract Study Area.

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

Shoshonean groups also existed in the region.

Crow emigration from Hidatsa occupations on the Middle Missouri to the upper Yellowstone is well documented (Beckes and Keyser 1983). By the nineteenth century the Crow occupied much of southeastern Montana and northcentral Wyoming. Vision quest structures and other traditional sites are known in the Pine Breaks. A variety of plant species of ethnobotanical importance are currently harvested in the general area.

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

Native American tribes were consulted at a general level in 1995-1996 as part of an effort to update the BLM *Buffalo Resource Management Plan*. An executive summary of the cultural resources identified on the PSO Tract has been sent to tribes known to have an interest in the region. While only the Crow and Cheyenne River Sioux Tribes have visited or expressed an interest in visiting the area, BLM will work with interested tribes to provide tours of the area and specific resources.

3.4.14 Paleontological Resources

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

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

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

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

3.4.15 Visual Resources

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

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

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

Creek and Youngs Creek roads (Figure 3-15) and is therefore plainly visible to passers-by. Those traveling these improved, aggregate-surfaced roads are typically local residents and the traffic volume is light. The natural scenic quality of the general analysis area is fairly high due to the relatively unaltered condition of the rugged topography and native vegetation, yet it is predominantly hidden from the view of the general public.

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

> Class I - Natural ecologic changes and very limited management activity is allowed. Any contrast (activity) within this class must not attract attention.
>
> Class II - Changes in any of the basic elements (form, line, color, texture) caused by an activity should not be evident in the landscape.
>
> Class III - Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.
>
> Class IV - Activity attracts attention and is a dominant feature of the landscape in terms of scale.
>
> Class V - This classification is applied to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

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

3.4.16 Noise

An individual's judgment of the loudness of a noise correlates well with the A-weighted sound level, or A-scale, system of measurement. Figure 3-16 presents dBA readings for some commonly heard sounds of daily life.

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

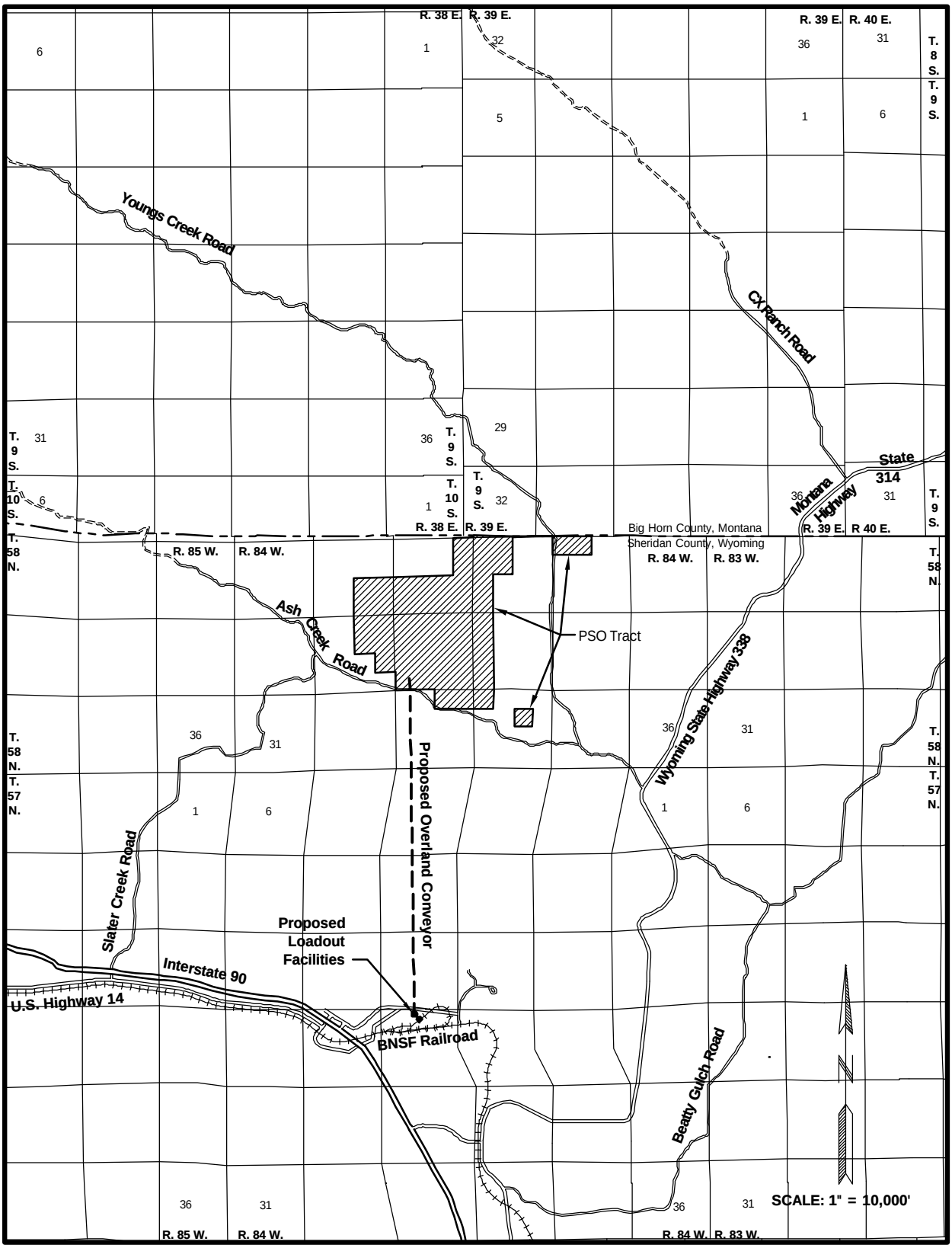


Figure 3-15. Transportation Facilities Within and Adjacent to the PSO Tract.

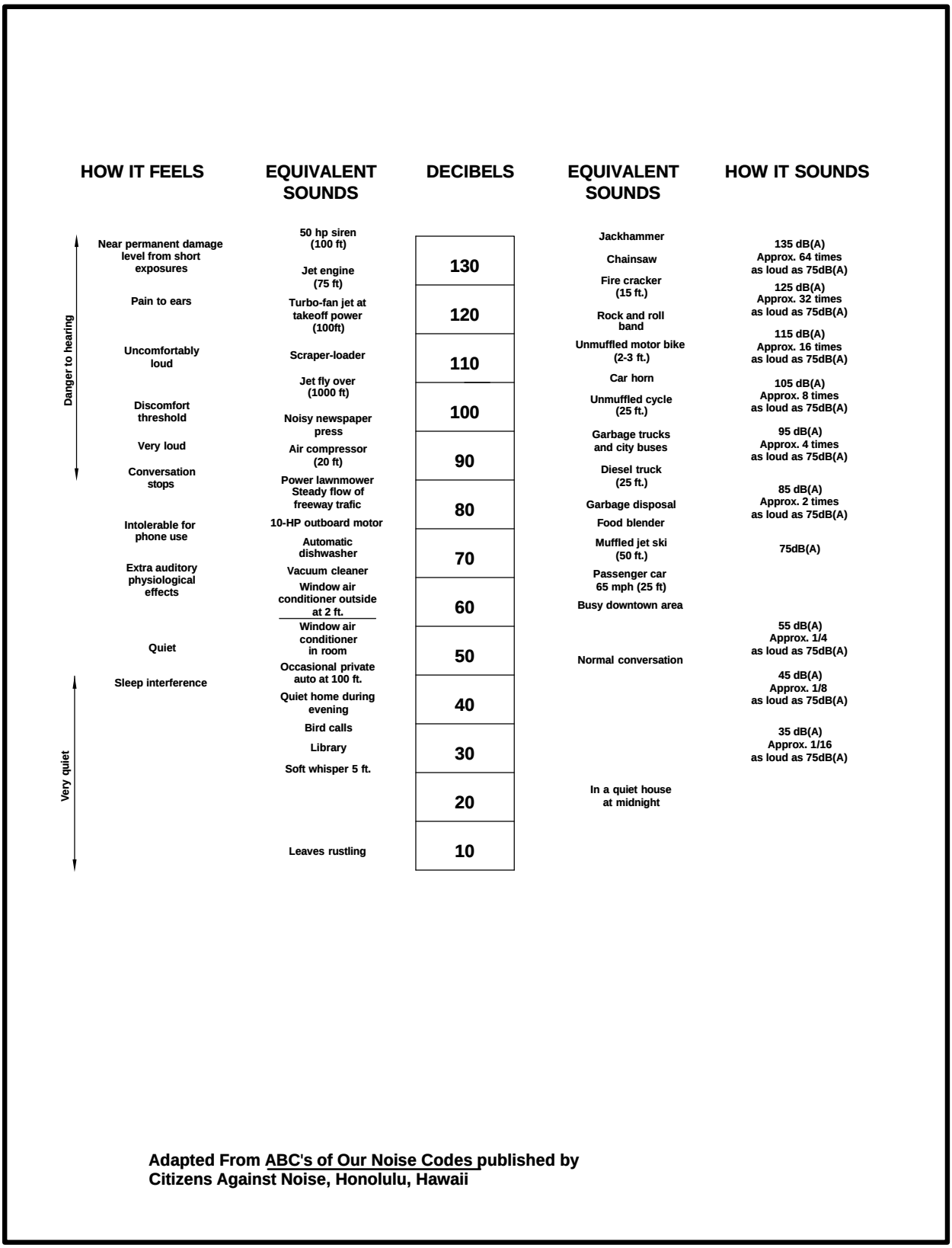


Figure 3-16. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life.

sources in the PSO Tract area is probably in the range of 30 to 50 dBA.

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

3.4.17 Transportation Facilities

The transportation facilities that exist in the vicinity of the PSO Tract area include the BNSF Railroad; Wyoming State Highway 338; improved county roads, including Youngs Creek Road (a.k.a. County Road 1237); improved local roads, including Ash Creek and Slater Creek Roads; unimproved local roads and two-track trails related to ranching and oil and gas activities; and numerous pipelines associated with both the conventional Ash Creek oil fields and CBM development.

Current transportation facilities within and adjacent to the PSO Tract area are depicted on Figure 3-15. Since the development of the Ash Creek Mine would require a coal transportation facility, the proposed 24,000-ft long overland conveyor running due south from the mine to a loadout facility on the BNSF mainline is also depicted on this figure. As indicated in Chapter 2, the location of the conveyor line is conceptual. If the exchange is completed and if P&M proceeds with plans to open a new surface coal mine, they would have to acquire rights-of-way for the proposed conveyor and loadout facility as well as the required construction permits before construction activities for the conveyor and loadout facility could begin. The actual location of the conveyor and loadout facility could change based on a number of factors including costs, rights-of-way negotiations, and requirements imposed by the construction permits.

3.4.18 Socioeconomics

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

3.4.18.1 Population

According to 2000 census data, Sheridan County had a population of 26,560, with Sheridan accounting for 15,804 of the county's residents, Ranchester 701, and Dayton 678

(USDC 2001). The 1990 population of Sheridan County was 23,562. Thus there was an increase of 2,998 persons or 12.7 percent over the 10-year period. Sheridan County's population change from 1990 to 2000 ranked 1,158 out of 3,141 counties in the U.S. (U.S. Census Bureau 2001b).

Sheridan County is an area of relatively low growth (one to two percent per year), and facilities (hospitals, schools, etc.) are adequate. School enrollment is actually declining due to an aging population. The median age in Sheridan County is 40.6 years, compared to a state-wide median of 36.2 years (Wyoming Department of Administration and Information July 2001). The rate of population growth in Sheridan County has increased somewhat since 2000 due to the current CBM boom. This has contributed to both a low housing vacancy and an overcrowded jail system in Sheridan, although enrollment in schools has not increased due to a relatively young, transient work force.

3.4.18.2 Local Economy

Although the State's coal production is increasing, as reported by the Wyoming State Inspector of Mines, Sheridan County's last remaining coal mine, Big Horn Coal Company, closed down and began final reclamation in 2000. Big Horn's production in 2000 was only 38,411 tons and it employed just 11 persons that year. Coal production in Sheridan County ended by 2001 (Wyoming State Inspector of Mines 2000, 2001).

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

Total mineral income to the State of Wyoming in 2002 was $1,182,329,122, an all-time high. This income was comprised of ad valorem taxes ($423,636,794 or 35.8 percent), royalty returns ($271,751,837 or 23.0 percent), severance taxes ($381,978,701 or 32.3 percent), and sales and use taxes, state rent, state royalties, and filing fees ($104,961,790 or 8.9 percent) (Wyoming Business Council 2003).

The 2002 valuation on minerals produced in Wyoming in 2001 was $6,738,726,062. This is 60 percent of the state's total valuation and places Wyoming among the top ten mineral producing states in the nation. The 2002 valuation on minerals produced in Sheridan County in 2001 was only $35,851,556, a fraction of a percent

of the state's total (Wyoming Business Council 2003). Minerals (coal, oil, and gas) accounted for only 1.2 percent of Sheridan County's total assessed valuation in 2000 of $145,093,161 (Wyoming Department of Revenue 2001). In 2002, minerals (just oil and gas) accounted for 22.3 percent of Sheridan County's total assessed valuation of $225,468,629 (Wyoming Department of Revenue 2003).

3.4.18.3 Employment

As of December 2002, the total labor force in Sheridan County stood at 14,288 with an unemployment rate of 4.8 percent, compared to a total labor force of 14,216 and an unemployment rate of 4.5 percent in December 2000 (Wyoming Department of Employment 2003). The annual average employment in Sheridan County has generally increased since 1990, when it stood at 11,416 persons. In 2002, the annual average was 13,745 employed persons in the county (Wyoming Department of Employment 2003).

In 2000, the largest employment sector in Sheridan County was the service sector, with 2,695 employees. This was followed by retail trade (2,410), local government (1,850), construction (936), and federal government (600). Together, these sectors accounted for nearly 80 percent of the county's employment. Mining, which includes oil and gas, employed only 55 persons in Sheridan County in 2000 (Wyoming Department of Employment 2003).

The preceding statistics obviously do not account for employees at the Decker and Spring Creek Coal Mines. These mines are located in Montana, which receives the payroll taxes, royalties, and production taxes, but most of the employees reside in Sheridan County. In 2002, the Decker and Spring Creek mines employed 225 and 126 people with estimated payrolls of $10,000,000 and $6,715,000, respectively (Montana Coal Council 2003). Decker Coal Company reduced nearly 20 percent of its workforce in March 2003 due to plans to reduce production.

Large gains in the oil and gas industry were responsible for 4,800 new jobs in Wyoming in April 2001, a growth rate of 21 percent, and the largest state employment gains were in the mining industry with a 12.9 percent increase in jobs from April 2000 to April 2001 (Sheridan County Roundup August 2001). The most notable new business formation in the state was in the mining industry in 2001. After five years of steady increase (18.6 percent average annual rate), the mining industry experienced a 50 percent increase in new firms. The large gain may in large part reflect CBM development. In 2000 and 2001, about 33 percent of the new mining firms were located in Campbell County, 10 percent in Natrona County, nine percent in Johnson County, and eight percent in Sheridan County (Department of Employment 2003).

From November 2001 to November 2002, Wyoming employment grew by 1,200 jobs, or 0.5 percent.

Construction posted especially strong gains, followed by the services and government sectors. During this same time frame, coal mining increased by 200 jobs and oil and gas extraction fell by 1,100 jobs (Department of Employment 2003).

Employment in northeastern Wyoming has certainly been affected by the recent CBM development, although state employment experts say it's difficult to track the impact on employment in Sheridan County.

3.4.18.4 Housing

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

Sheridan County had the second highest cost of living index in the state as of January 2003. It ranked highest of all the counties for food, fourth in housing and apparel, tenth in transportation, third in medical, and sixth in recreation/personal care. Housing rental rates are rising much faster than the general consumer price index. Comparing the fourth quarters of 2002 and 2001, rental rates in Sheridan County had risen 5.8 percent for apartments, 28.4 percent for mobile home lots, 6.9 percent for houses, and 41.6 percent for mobile homes. This compares with a statewide overall inflation rate of 3.7 percent (Wyoming Department of Administration and Information April 2003).

According to the Department of Employment, the population in Wyoming's northeast area grew by 12.7 percent over the past decade, but housing stock only increased by 6.2 percent (Sheridan County Roundup August 2001). Campbell, Johnson, and Sheridan Counties all have housing costs at or above the statewide average as a result of the sustained energy development activity in the region. Housing cost would be expected to decrease if natural gas or coal extraction activities suffered a prolonged decline (Wyoming Department Administration and Information April 2003).

3.4.18.5 Local Government Facilities and Services

Most of the tax revenues in Sheridan County come from sales and use taxes and property taxes.

Mineral production provides a minor source of revenues to local governments in Sheridan County. This is a change from the 1980s, before the Big Horn Coal mine began to close down their operations and prepare for final reclamation. Production at Big Horn Coal peaked at four million tpy in 1981 and declined steadily after a long-term contract with Chicago's Commonwealth Edison expired in 1988. During the peak production years, Big Horn Coal accounted for nearly half the county's assessed valuation (Sheridan Press, March 12, 1994). In 2000, the mine produced only 38,400 tons and employed just 11 persons, and by 2001 the mine had been completely reclaimed and no longer had any employees (Wyoming State Inspector of Mines 2000, 2001). State-wide, the assessed valuation for minerals was 60.0 percent of the total assessed valuation in fiscal year 2002. In Sheridan County, the total assessed valuation for 2002 was $225 million, up 32.5 percent from the prior year. $35.9 million of that was from mineral production, up from just $1.8 million in 1999 due to a significant increase in natural gas production. Residential property is currently the largest source of assessed valuation for the county. Total 2002 property taxes levied in Sheridan County were $15.3 million, up 31.0 percent from the prior year (Wyoming Taxpayers Association 2003). Minerals are taxed at 100 percent of assessed valuation, while industrial property is taxed at 11.5 percent of assessed valuation and all other real and personal property at 9.5 percent.

Most of Wyoming's property taxes fund education (about 69.7 percent), with the remainder going to county governments (20.6 percent), special districts (4.0 percent), community college (3.8 percent), and municipalities (1.9 percent). Because minerals are taxed at full valuation, counties vary in property tax wealth. For example, in Niobrara County one mill raises $39,843 in taxes, while in mineral-rich Campbell County one mill raises $2.2 million (Wyoming Taxpayers Association 2003).

In Sheridan County there are 17 jurisdictions levying property taxes. These include five municipalities, three school districts, two recreation districts, one community college, one weed and pest control district, and five fire districts.

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

3.4.18.6 Social Conditions

Sheridan County is experiencing a relatively stable social setting. Coal mining is no longer a major force in the local economy as it once was, but employees of the Spring Creek and Decker mines in Montana reside primarily in Sheridan County. The Decker mine was forced to reduce about 20 percent (approximately 40 people) of its workforce in March 2003 due to

plans to reduce nearly one-third of its annual production (Sheridan Press 2002).

There is interest in CBM development in Sheridan County. The most significant challenge CBM companies will be faced with on the western side of the PRB will be the issue of split estate. More than 60 percent of the mineral estate is federally owned, yet the surface is owned largely by private surface owners. Landowners have expressed that they are concerned about how they will be able to coexist with the development. The aesthetics of the land in Sheridan County are considered by many to be a commodity as much as the minerals below it. To avoid potential clashes, CBM operators will need to thoughtfully include the landowners in the early planning stages of development.

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

Wyoming's economy reached the bottom of an energy bust in 1987 and started to recover. That recovery began to slow in 1996, due to low prices for coal, oil, and gas. In 1999, for the first time since 1977, minerals comprised less than half of the state's total assessed valuation. Since then energy and fuel prices have risen, and this trend is expected to continue. The forecast is for slow growth through 2009; Wyoming's population is projected to increase at 1.0 percent per year. Non-agricultural employment is projected to increase by 10.2 percent by 2009, increasing 1.1 percent per year. Mining employment (including oil and gas) is projected to grow by 7.5 percent by 2009, mostly within the oil and gas sector (Wyoming Department of Administration and Information April 2001). In 2001, there were 19,500 jobs in the mining sector in Wyoming. This number was up 13 percent from the 17,160 mining jobs in 2000. This large increase was almost entirely attributed to increases in oil and gas jobs, from 9,400 in 2000 to 11,800 in 2001. Despite a loss of about 1,100 jobs in the oil and gas sector in 2002 (Department of Employment 2003), continued development of CBM resources in Wyoming may cause greater increases in the mining sector through 2009 than previously estimated.

3.4.18.7 Environmental Justice

Environmental Justice issues are concerned with actions that unequally impact a given segment of society either as a result of physical location, perception, design, noise, or other factors. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority

Populations and Low-Income Populations" was published in the *Federal Register* (59 FR 7629). The Executive Order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level). The Executive Order makes it clear that its provisions apply fully to Native American populations and Native American tribes, specifically to effects on tribal lands, treaty rights, trust responsibilities, and the health and environment of Native American communities.

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

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

3.4.19 Hazardous and Solid Waste

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

4.0 ENVIRONMENTAL CONSEQUENCES

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

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

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

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

4.1 Impacts of Acquiring the Bridger Lands

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

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

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

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

4.2 Impacts of Acquiring the JO Ranch Lands

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

These lands are currently used for livestock grazing and wildlife habitat, consistent with the typical uses of the surrounding BLM lands.

The existing 1990 *Great Divide Resource Management Plan* does not address acquisition of lands, but it identifies exchanges as the preferred method of disposal and acquisition of lands. Under the Proposed Action, the BLM Rawlins Field Office would change the *Great Divide Resource Management Plan*, with public input, to address land acquisition and BLM management of these lands.

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

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

4.3 Impacts of Acquiring the Welch Lands

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

Section 206 of FLPMA, which deals with exchanges, and Section 209 of FLPMA, which deals with the reservation and conveyance of minerals, have both been incorporated into the existing *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office*. Under the Proposed Action, the BLM Buffalo Field Office would determine future management of the Welch lands, with public input, through additional NEPA analysis and planning decisions, if the exchange is completed.

The Welch lands are a unique area in northern Sheridan County containing highly productive riparian haylands, upland hills, scoria outcrops, and river and riparian habitat. Since it includes about 1.5 miles of the Tongue River, the property has high potential for public recreation including fishing, big game and bird hunting, non-motorized boating or floating, hiking, horseback riding, mountain biking, and picnicking. The location of the Welch lands adjacent to the Tongue River and Thunder Child Rehabilitation Center may offer some recreational and management opportunities.

If the exchange is completed, BLM does not plan to change the existing management of the Welch lands. Existing uses on the Welch lands and surrounding area include livestock grazing and oil and gas development. These uses would continue under management to protect the existing conditions. Land uses that do not currently exist on the lands, such as motorized recreation, would be evaluated with public input through additional NEPA analysis and planning decisions, if the exchange is completed.

If the exchange is completed as proposed, BLM would acquire all of the offered Welch lands, including the underground coal fire that occupies approximately 13 acres of the SW¼ of Section 2, T.57N., R.84W. Based on a comparison of the current fire location with maps showing the areas of burning coal in the past, this coal seam fire has moved north several hundred feet during the past 24 years, and will probably continue to burn northward and westward until: 1) it runs out of coal, either by hitting an outcrop or prehistoric burn line; 2) the supply of oxygen is cut off because subsidence fractures and cracks fail to reach the surface; 3) the coal drops below the water table; or 4) the area is fully reclaimed by WDEQ/AMLD (which may be very difficult due to the depth of the fire). Burning could continue for tens to hundreds of years. BLM is considering exchange options that would not involve BLM acquisition of the area occupied by the underground coal fire. These options are discussed in Chapter 2 and in the technical report on the fire that is included as Appendix D of this document.

If the exchange is completed as proposed and BLM acquires all of the offered Welch lands, there are several options for managing the underground coal fire if the exchange is completed. These include fencing off the coal seam fire area and posting warning signs, designating the coal seam fire as a research natural area, developing the fire area as an educational showcase of the natural coal burning process, or reclaiming the fire in cooperation with the WDEQ/AMLD. The WDEQ/AMLD may use SMCRA funds to reclaim fires associated with mining that occurred prior to the SMCRA eligibility date which present a hazard to public safety, and for which there is no responsible party with reclamation obligations for the site. More information on these options is included in Appendix D.

BLM would evaluate these options with public input, through additional NEPA analysis and planning decisions, if the exchange is completed.

Potential hazards to the public, if public access to the area is allowed, would include:

- noxious or explosive gases including methane and carbon monoxide;
- depleted levels of oxygen near the fissures;
- hot spots on the ground which may mask a fissure and cause burns if stepped on;
- unstable ground near fissures which could collapse under weight;
- danger of burns or suffocation if someone fell in a fissure; and
- risk that the coal fire would ignite forest and range vegetation.

4.4 Impacts of Exchanging the Coal in the PSO Tract

If P&M acquires the federal coal beneath the PSO Tract under the Proposed Action, it is assumed that the PSO Tract would be developed into a new surface mine. For this analysis, it is also assumed that all the federal coal within the PSO Tract would be exchanged and be a part of the proposed Ash Creek mine plan (although the actual amount of coal to be exchanged will depend upon the appraisal process). The boundaries of the tract would be consistent with the tract configurations proposed by P&M in the exchange proposal. In order to recover all of the mineable coal included in the PSO Tract, the area that would have to be permitted would include the tract as proposed 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. The adjacent, privately-owned coal, shown in Figure 2-2, would be included in the permit area if P&M successfully negotiates a mining agreement with the owner of that coal. In addition, P&M's current proposal includes an overland conveyor, which would be used to transport the coal from the mine area to a unit train loadout facility located beside the BNSF mainline railroad tracks, which are located approximately four miles south of the PSO Tract. If the exchange is completed and if P&M proceeds with its proposal to open a surface coal mine, they would have to negotiate access for the proposed conveyor with the adjacent surface landowners prior to its construction. Table 4-1 shows the area of the PSO Tract that would be mined and the disturbance area, which includes an estimated 99.5 acres of disturbance for the overland conveyor and an estimated 104.5 acres of disturbance for the rail loop and loadout facilities. The environmental consequences of implementing the Proposed Action or Alternative 3 would be the same.

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

	No Action Alternative	Proposed Action
Total Area of Federal Coal Exchanged (Acres)	none	2,045
Estimated Area of Federal Coal Mined (Acres)	none	1,079
Estimated Total Area of Coal Mined (Acres)	none	1,720
Estimated Total Disturbance Area (Acres)[1]	none	2,595

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

The coal would not be mined under Alternatives 1 and 2.

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

4.4.1 Topography and Physiography

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

Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. The original topography of the PSO Tract is somewhat rugged. As a result, the expected post-mining

topography would be more homogenous and subdued, but would blend with the undisturbed surroundings. Following reclamation, the average post-mining topography would be slightly lower in elevation than the pre-mining topography due to removal of the coal. (The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted, excavated, and backfilled.) The land surface would be restored to the approximate original contour or to a configuration approved by WDEQ/LQD during the mine permitting process.

Direct adverse impacts resulting from topographic moderation include a reduction in microhabitats (e.g., cutbank slopes and bedrock bluffs) for some wildlife species and a reduction in habitat diversity, particularly a reduction in slope-dependent shrub communities and associated habitat. A potential indirect impact may be a long-term reduction in big game carrying capacity. A direct beneficial impact of the lower and flatter terrain would be reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur as a result of higher near-surface bulk density of the reclaimed soils (Section 4.4.3). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater.

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

4.4.2 Geology and Minerals

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

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

thick, and in the northern part of the mine area where both the Dietz 3 and Dietz 1 seams would be mined, the replaced backfill thickness would average approximately 260 ft.

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

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

As discussed in Sections 3.4.3 and 3.4.11, CBM development has rapidly occurred within and adjacent to the PSO Tract since 1999, and there are three potential coal seams (Dietz 3, Monarch, and Carney) that would be expected to produce CBM in the area. Only the Dietz 3 seam would be directly affected by mining. CBM resources that are not recovered from the Dietz 3 on the PSO Tract prior to mining would be irretrievably lost when the coal is removed. Dewatering that occurs as a result of mining also lowers the coal seam aquifer's water levels and reduces the hydrostatic pressure, which may allow CBM to desorb and escape from the Dietz 3 seam on lands adjacent to the PSO Tract if it is not recovered prior to mining. CBM in the Monarch and Carney seams not recovered prior to mining could be recovered after mining. However, those resources could potentially be drained from underneath the PSO Tract during mining by wells completed in the Monarch and Carney seams on lands adjacent to the tract.

Currently, there are 191 CBM wells completed or permitted to be drilled within T.57N., R.84W., and there

are 67 CBM wells within three miles of the PSO Tract in Montana. Nineteen CBM well locations (five existing and 14 permitted) are within the boundary of the federal coal being considered for exchange. The development of CBM in Sheridan County (Wyoming) and Big Horn County (Montana) has been affected by uncertainty due to difficulties in the disposal of groundwater produced from the coal beds.

Groundwater from the Fort Union Formation coal seams in the northern and western parts of the PRB has a relatively high SAR, which has caused concern about issuing permits to discharge CBM water into tributaries of the Tongue River. In the BLM's preferred alternative (Alternative 2A) in the *Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project*, it is assumed that CBM-produced water in the Upper Tongue River sub-watershed would be handled by discharge following passive treatment (five percent), by infiltration (65 percent), by containment impoundments (five percent), by land application disposal (15 percent), or by injection (10 percent) (BLM 2003a).

For this analysis, it is assumed that each CBM well would produce until mining activity approaches that well. This arrangement would be dependent on cooperation between the federal oil and gas lessees, the owners of the private oil and gas rights (Figure 3-14), and P&M. The *Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project* assumed an average well life of seven years for CBM wells in the PRB, based on a review of average production well life for existing wells east and west of the Powder River. The highest production rates typically occur during the first half of a well's life. Therefore, BLM estimates that a large portion of the CBM reserves could be recovered prior to initiation of mining activity on the PSO Tract. If the land exchange is completed and P&M proceeds with its proposal to open a surface coal mine on the PSO Tract, CBM reserves not recovered from the Dietz 3 prior to mining would be vented to the atmosphere. Any facilities and equipment associated with CBM production and development on the PSO Tract would have to be removed prior to mining.

4.4.3 Soils

Disturbance related to coal mining would directly affect 2,595 acres of soil resources on and adjacent to the PSO Tract if P&M successfully acquires the coal underlying the PSO Tract and the rights to mine the adjacent privately-owned coal. The reclaimed soils would have different physical, biological, and chemical properties than the pre-mining soils. They would be more uniform in type, thickness, and texture. Average topsoil thickness would be 24 to 36 inches across the entire reclaimed surface. Soil chemistry and soil nutrient distribution would be more uniform, and average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would

result in more uniform vegetative productivity on the reclaimed land. The replaced topsoil would support a stable and productive vegetation community adequate in quality and quantity to support the planned post-mining land uses (wildlife habitat and rangeland).

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

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

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

4.4.4 Air Quality

Regulatory Background

Air pollution impacts are limited by local, state, tribal, and federal air quality regulations and standards, and implementation plans established under the CAA and administered by WDEQ/AQD in Wyoming and MDEQ/AWM in Montana.

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

Pursuant to the CAA, the EPA has developed classifications for distinct geographic regions known as air basins and for major MSAs. Under these classifications, for each federal criteria pollutant, each air basin (or portion of a basin or MSA) is

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

Criteria Pollutant	Wyoming Standards		Federal Standards	
	Averaging Period	Concentration[a]	Primary Concentration[a]	Secondary Concentration[b]
Ozone (O^3)	1-Hour	120 ppbv (235 Pg/m^3)	120 ppbv (235 Pg/m^3)	Same as Primary Standards
	8-Hour[b]	80 ppbv[c] (157 Pg/m^3)	80 ppbv (157 Pg/m^3)	----
Carbon Monoxide (CO)	8-Hour[d]	9 ppmv (10 mg/m^3)	9 ppmv (10 mg/m^3)	----
	1-Hour[e]	35 ppmv (40 mg/m^3)	35 ppmv (40 mg/m^3)	----
Oxides of Nitrogen (NO_x) as Nitrogen Dioxide (NO_2)	Annual	100 Pg/m^3 (50 ppbv)	100 Pg/m^3 (53 ppbv)	Same as Primary Standards
Sulfur Dioxide (SO_2)	Annual	60 Pg/m^3 (20 ppbv)	80 Pg/m^3 (30 ppbv)	----
	24-Hour[d]	260 Pg/m^3 (100 ppbv)	365 Pg/m^3 (140 ppbv)	----
	3-Hour[d]	1,300 Pg/m^3 (500 ppbv)	----	1,300 Pg/m^3 (500 ppbv)
Particulate Matter d10 Microns in Aerodynamic Diameter (PM_{10})	24-Hour[d]	150 Pg/m^3	150 Pg/m^3	Same as Primary Standards
	24-Hour (Based on the 99th Percentile Averaged over Three Years)	----	150 Pg/m^3	----
	Annual Arithmetic Mean	50 Pg/m^3	50 Pg/m^3	Same as Primary Standards
Particulate Matter d2.5 Microns in Aerodynamic Diameter ($PM_{2.5}$)	24-Hour (Based on the 98th Percentile Averaged over Three Years)	65 Pg/m^3	65 Pg/m^3	----
	Annual Arithmetic Mean Averaged over Three Years	15 Pg/m^3	15 Pg/m^3	----
Lead (Pb)	Calendar Quarter	1.5 Pg/m^3	1.5 Pg/m^3	Same as Primary Standards
Hydrogen Sulfide	½ Hour	Primary 70 Pg/m^3[e]	----	----
	½ Hour	Secondary 40 Pg/m^3[f]	----	----
Suspended Sulfates	Annual	250 Pg/m^3	----	----
	30 Day	500 Pg/m^3	----	----
Fluorides in Ambient Air	12 Hours	3 Pg/m^3	----	----
	24 Hours	1.8 Pg/m^3	----	----
	7 Days	0.5 Pg/m^3	----	----
	30 Days	0.4 Pg/m^3	----	----

[a] Equivalent units given in parentheses are based upon a reference temperature of 25 degrees C and a reference pressure of 760 mm mercury. Measurements of air quality are corrected to a reference temperature of 25 degrees C and a reference pressure of 760 mm mercury (1,013.2 millibar); ppmv and ppbv in this table refer to parts per million by volume and parts per billion by volume, respectively, or micro-moles of pollutant per mole of gas.

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

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

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

[e] Not to be exceeded more than two times per year.

[f] Not to be exceeded more than two times in five consecutive days.

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

Under requirements of the CAA, the EPA has established PSD rules, the purpose of which is to prevent deterioration of air quality in areas that are in attainment with the NAAQS. Increases in ambient concentrations of NO_2, SO_2, and PM_{10} are limited to modest increments in Class II areas (most of the country), and to very small increments in Class I areas (national parks and other designated pristine areas).

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

195 miles east-southeast of the PSO Tract.

Federal PSD regulations limit the maximum allowable increase in ambient particulate matter in a Class I airshed resulting from a major stationary source or major modification to 4 Pg/m^3 (annual geometric mean) and 8 Pg/m^3 (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities which emit, or have the PTE, 100 tpy or more of PM_{10} or other criteria air pollutants, or any facility which emits, or has the PTE, 250 tpy or more of PM_{10} or other criteria air pollutants, is considered a major stationary source. However, fugitive emissions are not counted against the PSD threshold unless the source is so designated by federal rule (40 CFR 52.21).

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

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

There are no NAAQS for NO_2 for periods shorter than one year, but there is concern about the potential health risk associated with short-term exposure to NO_2 from blasting emissions.

As discussed in Section 3.4.5, there is public concern over the releases of NO_2 from overburden blasting, which can form a low-lying, gaseous orange cloud that can be transported by wind. NO_2 is a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Gaseous NO_2 is reddish-brown, heavier than air and has a pungent odor. It is highly reactive and combines with water to form nitric acid and nitric oxide. "Nitrogen dioxide gas may cause

significant toxicity because of its ability to form nitric acid with water in the eye, lung, mucous membranes and skin" (EPA 2001). Acute exposure may cause death by damaging the pulmonary system. "Chronic or repeated exposure to lower concentrations of NO_2 may exacerbate pre-existing respiratory conditions, or increase the incidence of respiratory infections" (EPA 2001).

NIOSH, OSHA, and EPA have identified the following short-term exposure criteria for NO_2:

- NIOSH's recommended Immediately Dangerous to Life and Health level is 20 ppm (37,600 Pg/m^3);
- EPA's Significant Harm Level, a one-hour average, is 2 ppm (3,760 µg/m^3);
- OSHA's Short-Term Exposure Limit, a 15-minute time-weighted average, which was developed for workers, is 5 ppm (9,400 Pg/m^3, which must not be exceeded during any part of the workday, as measured instantaneously);
- NIOSH's recommendation for workers is a limit of 1 ppm (1,880 µg/m^3) based on a 15-minute exposure that should not be exceeded at any time during the workday; and
- EPA recommends that concentrations not exceed 0.5 ppm to protect sensitive members of the public (EPA 2003).

According to EPA "...the exact concentrations at which NO_2 will cause various health effects cannot be predicted with complete accuracy because the effects are a function of air concentration and time of exposure, and precise measurements have not been made in association with human toxicity. The information that is available from human exposures also suggests that there is some variation in individual response" (EPA 2001).

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

There are no state or federal rules that require the public or employees to stay back a certain distance from mine blasting operations in order to limit their exposure to NO_2. An administrative ruling by the Wyoming EQC recently approved a 2,500-ft setback of blasting operations from the southern boundary of the Eagle Butte Coal Mine when prevailing winds are blowing toward the mine's

downwind neighbors (Casper Star Tribune 2003). The Eagle Butte Mine is located just north of Gillette, Wyoming.

Specific Regulatory Applicability – Proposed Action

Emission inventories for the proposed Ash Creek Mine (Table 4-3) were developed for each year, based on the Life of Mine operating parameters shown in Table 4-4. For purposes of determining PTE for PSD and Title V applicability purposes, only point source emissions and fugitive truck dump PM_{10} emissions at the preparation plant would count towards the PTE applicability thresholds (Table 4-5). There are no applicable NO_x sources that would count against the PTE, therefore the NO_x PTE would be zero. The Proposed Action would not trigger PSD permitting requirements or federal Title V operating permit requirements based on these inventories.

Any New Sources of emissions locating within the State of Wyoming must obtain state construction and operating permits unless the emissions and impacts are determined to be "insignificant" by the Administrator of the WDEQ/AQD. While the term "insignificant" is not defined for these purposes within the WAQSR, the magnitude of emissions predicted from the Proposed Action would trigger state construction and operating permit requirements based on long standing WDEQ/AQD policy with regard to surface coal mines.

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

Certain "affected facilities at the coal preparation plant would also be subject to a 20 percent opacity standard as provided by the Federal Standards of Performance for Coal Preparation Plants (40 CFR 60, Subpart Y) and its equivalent State rule (WAQSR Chapter 5, Section 2 (b) Subpart Y). Affected facilities at the proposed Ash Creek Mine would include coal processing and conveying equipment (including crushers, coal storage systems, and coal transfer and loading systems).

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

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

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

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

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

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

Environmental Consequences – Significance Criteria

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

- violation of any regulatory requirement of U.S. EPA or WDEQ/AQD;
- violation of any state or federal ambient air quality standard; or
- significant contribution to an existing or predicted air quality standard exceedance.

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

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

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

The 500-meter distance was selected to approximate the area external to the active coal block which is needed for conduct of mining activities. For Wyoming compliance demonstrations, ambient air impacts are evaluated at the outside boundary of the LNCM, assuming that these areas are

fenced to preclude public access. This 500-meter distance from modeled area sources also allows all receptors to be located beyond the distance (one area source width) within which the ISC3 model may overpredict impacts because of approximations in the model area source algorithms.

Annual PM_{10} concentration estimates were generated for all mine, preparation plant, and truck loading sources. In order to determine total concentrations, a background concentration must be added to the source impact prediction for comparison to applicable ambient air quality standards. WDEQ uses a PM_{10} background concentration of 15 $\mu g/m^3$ for coal mine air quality permit analyses. In a coal mine permit analysis, emissions from the coal mine and all other sources in the area of the mine are added to this background, regardless of when it was permitted or built. In conducting an analysis of air quality impacts in the PRB for the Wyoming and Montana BLM, Argonne National Laboratory uses a PM_{10} background concentration of 17 $\mu g/m^3$. The Argonne air quality impact analysis background concentrations are recently monitored values and are intended to represent all sources permitted before a specific date. The Argonne analysis then considers sources constructed or modified after that date. Therefore, it considers only projected coal mine increases. The Argonne air quality impact analysis background is based on data collected in Gillette, Wyoming in 1999, which was extrapolated to the entire PRB.

Annual NO_x concentrations were generated for all mine, vehicular and blasting sources. A background of 20 Pg/m^3 was added to the source impact predictions for comparison to the applicable NO_2 standard, in accordance with WDEQ policy. Argonne National Laboratory selected a NO_x background concentration of 16.5 $\mu g/m^3$, based on data collected in Gillette, Wyoming in 1996-1997.

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

The mitigation measures considered in the modeling of the proposed Ash Creek Mine satisfy the requirements for BACT per Chapter 6, Section 2 of

the WAQSR. Those measures include:

- High efficiency baghouses on the crusher, conveyor transfers, storage bin and train loadout, meeting a standard of 0.01 grains per dscf of exit volume.
- Installation of a stilling shed to control fugitive emissions at the coal preparation plant truck dump.
- Application of water and chemical surfactant to haul roads.
- Watering of active work areas.
- Rapid re-vegetation of reclaimed surfaces.
- Reclamation plan to minimize surface disturbances subject to wind erosion.
- Paving of access roads.

Model results for PM_{10} and NO_2 impacts of the proposed Ash Creek Mine, based on WDEQ estimates of background concentrations, are shown in Figures 4-1 and 4-2. Table 4-6 presents the maximum predicted annual average concentrations of PM_{10} and NO_2 due to the proposed Ash Creek Mine, and maximum total concentrations after the addition of background levels due to distant and natural pollutant sources. In Table 4-6, the results are reported in terms of both the WDEQ and Argonne National Laboratory estimates of the background concentrations for PM_{10} and NO_2. Also shown are the applicable Wyoming and National AAQS.

Operation of the proposed Ash Creek Mine during the worst-case operating year is indicated to produce impacts below all ambient standards using either background concentration.

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

The PM_{10} and NO_2 modeling analysis also determined maximum predicted annual concentrations at surrounding Class I and sensitive Class II areas, as well as in the town of Sheridan. The model predicts that the concentrations caused by mining operations at the proposed Ash Creek Mine would be 0.07 Pg/m^3 (annual PM_{10}) and 0.15 Pg/m^3 (annual NO_2) at the Northern Cheyenne Reservation, the Class I/Sensitive Class II area with the highest impact. These predicted concentrations are well below Class II significance levels and Class I PSD increments.

The maximum predicted annual PM_{10} impact from the proposed Ash Creek Mine in the town of Sheridan is 0.27 Pg/m^3. This is below the "significant impact level" of 1.0 Pg/m^3 that would be deemed to

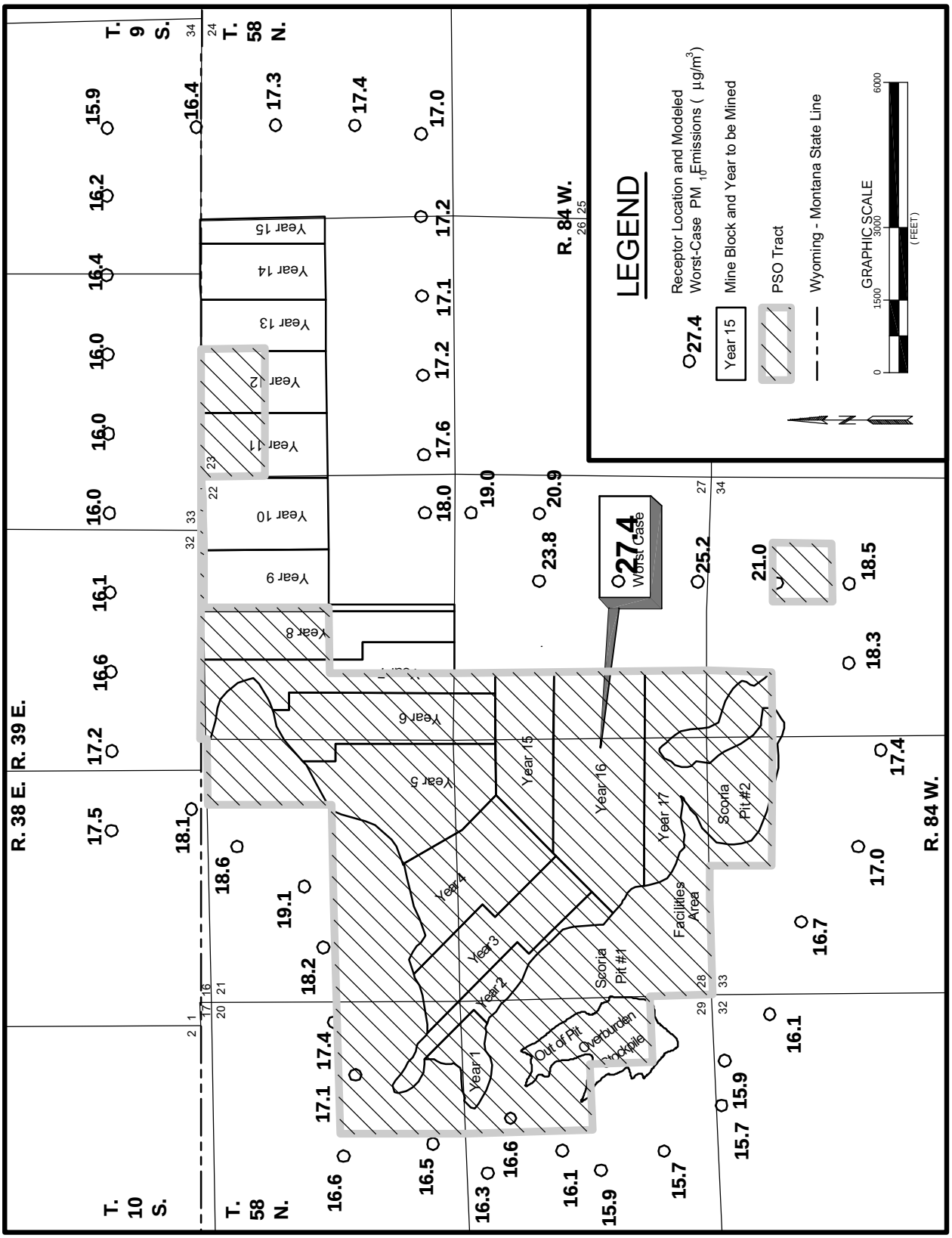


Figure 4-1. Modeled Maximum PM_{10} Annual Average Concentrations ($\mu g/m^3$), including Background of 15 $\mu g/m^3$, at the Proposed Ash Creek Mine.

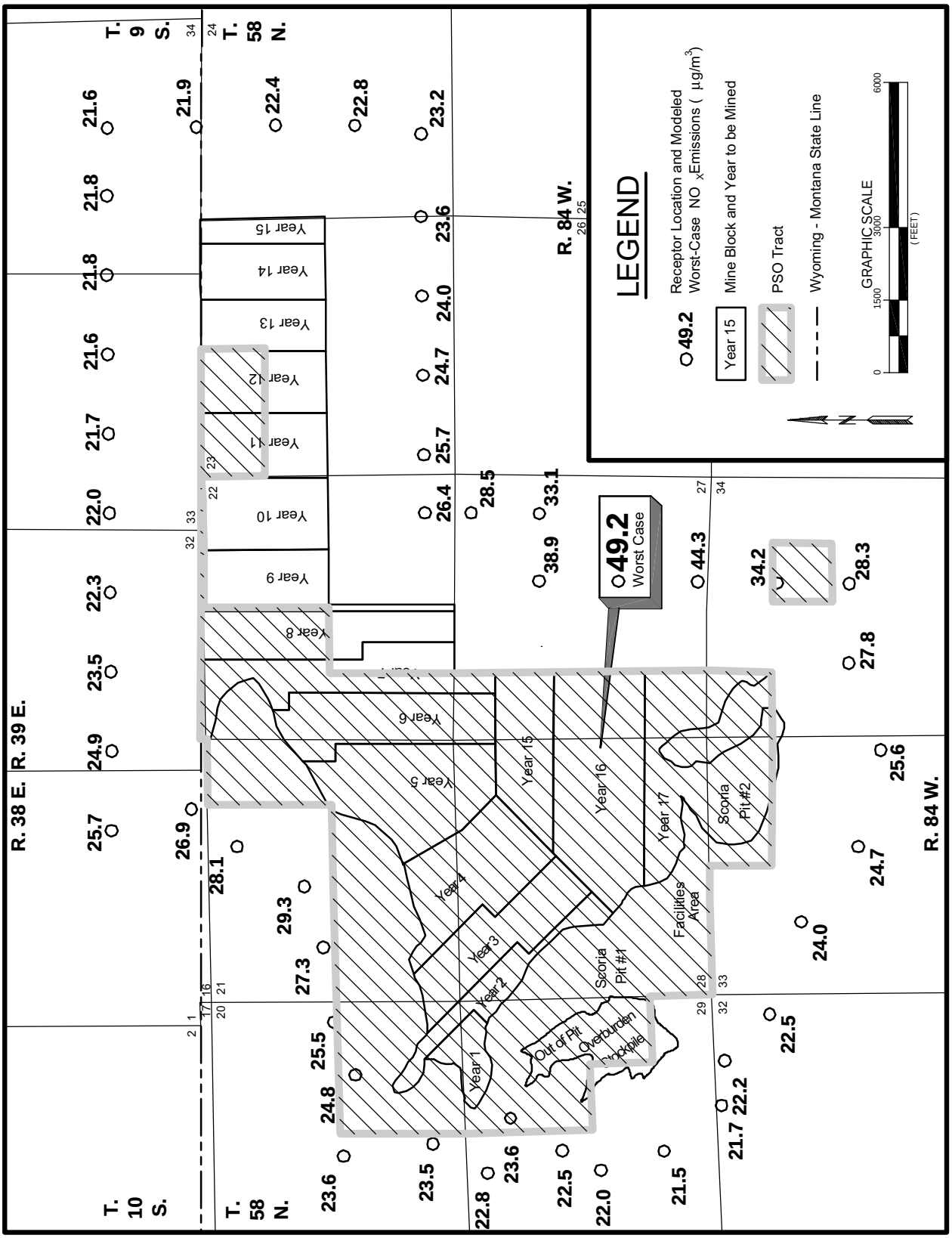


Figure 4-2. Modeled Maximum NO_X Annual Average Concentrations (µg/m³), Including Background of 20 µg/m³, at the Proposed Ash Creek Mine.

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

	PM_{10} (Pg/m³)	**NO_x (Pg/m³)**
Maximum Predicted Concentration	12.4	29.2
Background Concentration (WDEQ)	15.0	20.0
Total Concentration (WDEQ)	27.4	49.2
Background Concentration (Argonne)	17.0	16.5
Total Concentration (Argonne)	29.4	45.7
Federal AAQS	50	100
Wyoming AAQS	50	100

cause or contribute to an exceedance of the AAQS in the Sheridan non-attainment area.

PM_{10} and NO_2 levels would be elevated at dwellings and along roads in the vicinity of the proposed Ash Creek Mine during mining operations. There are five dwellings located at a distance of approximately one-quarter mile outside of the boundary of the federal coal being considered for exchange. Mining would occur near State Highway 338, the Ash Creek Road, and the Youngs Creek Road. The required mitigation measures, which are discussed in Section 4.6, would minimize this impact. As shown in Figures 4-1 and 4-2, the predicted PM_{10} and NO_2 levels in the vicinity of the mine would be below the annual NAAQS identified by EPA to protect public health and welfare.

Based upon WDEQ's experience in the PRB, they have stated that the risk posed by the release of NO_2 from blasting is very specific to the type of mining operation and to the location. The release of higher concentrations of NO_2 can be correlated to mining operations that employ cast blasting, which is a specific method of overburden blasting that is typically associated with dragline operations, and to operations that have saturated overburden conditions (Doug Emme 2003). In either case, the chance for the release of NO_2 emissions is increased due to the incomplete combustion of the ammonium-based blasting agent. P&M proposes to utilize shovel and truck equipment to remove overburden and would not employ cast blasting. In addition, the overburden and interburden strata in the proposed Ash Creek Mine area are not saturated. Therefore, the likelihood that there would be a high risk posed to the public or to mine employees due to the release of NO_2 from blasting at the proposed Ash Creek Mine is minimal.

Air quality impacts resulting from, or associated with, mining operations would be limited primarily to the operational life of the mine. During the time the PSO Tract is mined, the elevated levels of particulate matter in the vicinity of

the mining operations would continue, as would the elevated concentrations of gaseous emissions due to fuel combustion. Compliance with all state and federal air quality standards would be maintained.

4.4.5 Water Resources

4.4.5.1 Surface Water

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

A hydrologic control plan for the proposed Ash Creek Mine would be designed to prevent surface runoff from interfering with the mining operations and to maintain the quantity and quality of the waters as they occur on and adjacent to the tract. Streamflow in Little Youngs and Youngs Creeks would be diverted around the active mining areas in temporary diversion ditches. Disruptions to streamflow in Little Youngs and Youngs Creek, which might affect adjacent landowners downstream of the PSO Tract, would not be expected to be substantial.

Due to its location in the headwater area of West Branch, runoff from that drainage is not expected to be substantial; therefore, the hydrologic control would probably consist of allowing runoff to accrue to the mine pit, where it would be treated and discharged according to the standards of WDEQ/WQD. A large flood control reservoir or temporary drainage diversion for this stream is not anticipated.

If flood control impoundments are used in the operation, it would be necessary to evacuate them following major events to provide space for the next flood. All necessary diversion systems and drainage controls would be designed to prevent material damage and minimize adverse impacts to the hydrologic balance outside the permit area. All diversions and associated structures would be designed, using the BACT, to prevent additional contribution of suspended solids to streamflow outside the permit area, and protect the water rights of downstream users.

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

impact downstream areas. WDEQ/LQD would require a monitoring program to assure that sediment ponds would always have adequate space reserved for sediment accumulation.

During mining, pit water, which originates from groundwater seepage into the pit and from rainfall runoff within the pit and its associated drainage area, would be pumped into treatment/sediment ponds where solids would be allowed to settle before being discharged into surface waters outside the permit area. Effluent from the mine pits, which would predominantly be mixtures of naturally occurring groundwaters, should cause no detectable changes in the water quality of the receiving stream(s). Discharge quantity and quality would be monitored and reported according to WDEQ/LQD discharge permit requirements.

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

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

4.4.5.2 Groundwater

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

Mining operations at the proposed Ash Creek Mine would remove the coal seam aquifers on 1,720 acres and replace them with backfill composed of an unlayered mixture of the shale, siltstone, and sand that

make up the existing Fort Union Formation overburden and interburden. If P&M acquires the rights to mine the private coal in the north half of Sections 22 and 23, T.58N., R.84W., shown in Figure 2-2, the operations at the proposed Ash Creek Mine would also remove the alluvial aquifer of Little Youngs and Youngs Creeks. As the mining operation progresses through the stream valleys, these alluvial materials would be selectively salvaged and stockpiled as they are encountered in order to be replaced during reclamation.

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

As described in Section 3.4.6, the reclaimed PSO No.1 Mine/Ash Creek Mine is located within a coal aquifer flow system bound by regional northeast-trending faults that isolate groundwater flow to the northwest and southeast. Under baseline conditions, groundwater flow direction in the coal seams is generally northeastward, controlled by hydrogeologic boundaries created by these northeast-trending faults. Recharge to the system occurs where the seams contact clinker deposits in the uplands to the west and southwest of the PSO Tract, and generally wherever they subcrop beneath saturated alluvial deposits. Most discharge from the coal seams occurs to the east and northeast of the proposed Ash Creek Mine, along the Tongue River. Potentiometric drawdowns associated with mine pit dewatering would be confined within the northeast-trending fault block created by these hydrologic boundaries. In other words, the faults are assumed to be absolute barrier boundaries and no drawdowns would occur across them due to the stratigraphic displacements. In addition, structural faults have been observed to be barrier boundaries that restrict potentiometric drawdowns in the coal seams in the area of the Decker and Spring Creek Coal Mines (MDEQ 1999).

Groundwater level declines in the coal seam aquifers during active mining would be strongly controlled by faults that serve as barriers to groundwater flow and by the coal

seam outcrops and subcrops. The northeast-trending faults that bound the proposed mine area to the northwest and southeast would prevent or restrict groundwater drawdown in the Dietz 1 and Dietz 3 coal beds in those directions. Due to erosion and burning, the Dietz 1 and Dietz 3 coal seams are not continuous to the southwest, as shown in Figure 4-3. Therefore, drawdowns would generally extend only to the northeast for any appreciable distance from the mine. The extent of the potentiometric head declines in these two coal seams would probably be limited to the effective increase in the coal transmissivity where the seams coalesce downdip (northeast) of the PSO Tract, and the proximity to the seams' outcrops, subcrops, and recharge sources.

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

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

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

The predicted drawdown over the life of mine resulting from the

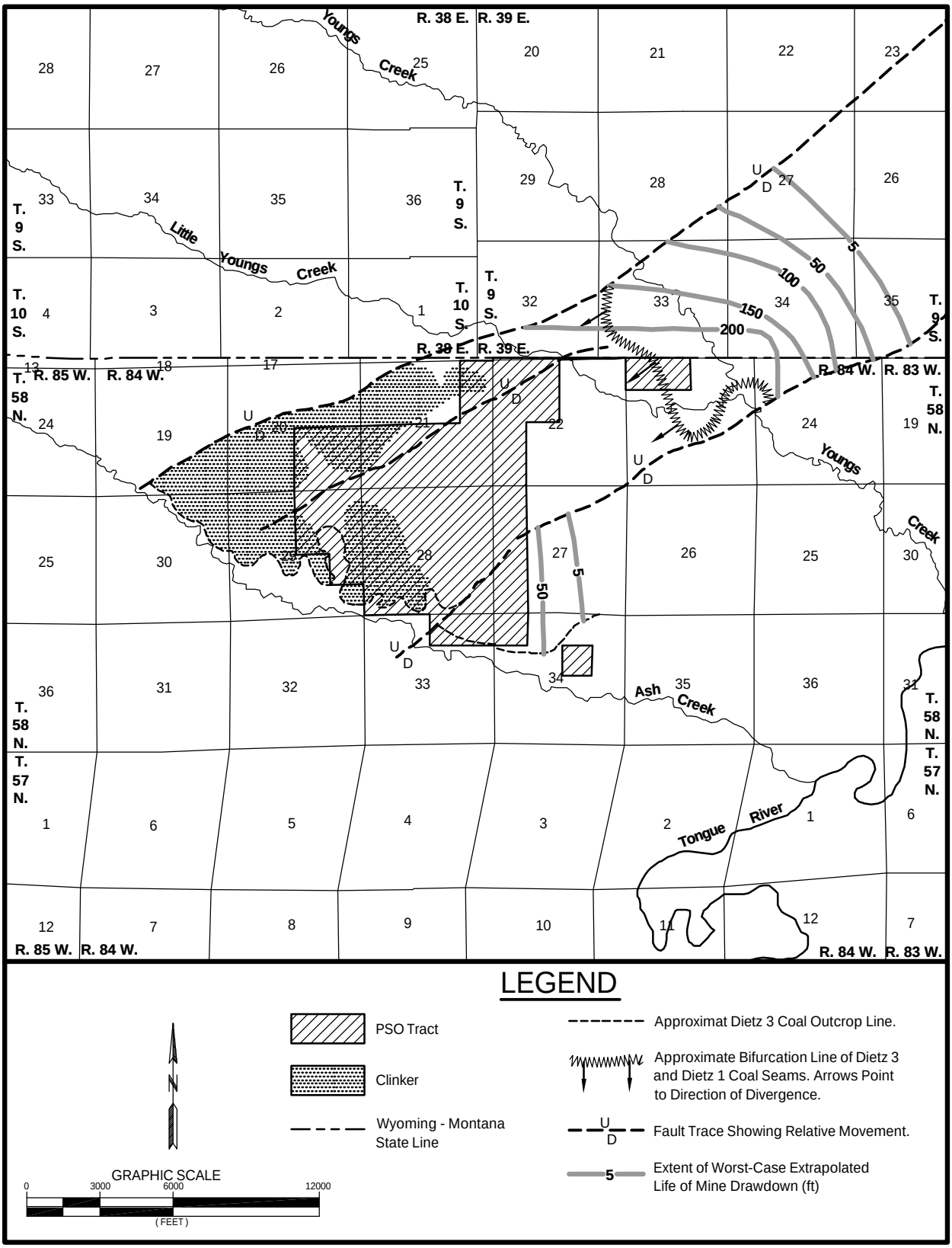


Figure 4-3. Life of Mine Drawdown Map, Resulting from Proposed Action.

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

As discussed in Chapter 3, in March 2003, the Wyoming SEO and Montana DNRC records indicated a total of 516 permitted water wells were located within three miles of the federal coal being considered for exchange, of which 500 are within Wyoming and 16 are within Montana. Of the 500 permitted wells in Wyoming, 85 are related to surface coal mining. There are 37 mine-related monitoring wells in Montana, although the DNRC does not require a Certificate of Water Right for scientific monitoring wells, as there is no beneficial use of water. Of the 431 other wells in Wyoming and Montana that are not related to surface coal mining, 38 are permitted for stock watering, 16 are permitted for domestic use, 18 are permitted for stock watering and domestic use, 224 are permitted for both CBM development and stock watering, 58 are permitted for CBM development only, 71 are permitted for both irrigation and CBM development, three are permitted for stock, miscellaneous, and CBM development, two are permitted for miscellaneous, and one is permitted for stock and irrigation use. In addition, a total of 67 CBM wells currently exist in Montana that are within a three-mile radius of the federal coal being considered for exchange. Similar to monitoring wells, the State of Montana has ruled that a Certificate of Water Right is not required for a CBM well unless the discharge water is put to a beneficial use (i.e., stock watering). A listing of the 431 permitted wells that are not related to mining is provided in Appendix G.

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

The potential for groundwater drawdown to affect neighboring groundwater users would be minimal. This determination was based on the finding that there are just two known groundwater right holders outside of the proposed mine area (excluding all CBM development wells) that are within the area of the five-ft drawdown contour, assuming both well completion depths are such that they produce water from the Dietz 1/Dietz 3 coal seam. As depicted by Figure 4-3, the extrapolated life of mine drawdown in the Dietz 1/Dietz 3 seam would be largely confined between two major northeast-

trending faults and the Dietz1/Dietz 3 outcrops to the southwest, along Ash Creek. As a result, most drawdown effects would attenuate northeastward from the mine into Montana. Both of the groundwater rights within the affected area are in Montana. These wells are shown on Table 4-7. No groundwater supply wells are expected to be impacted in Wyoming if the PSO Tract is mined.

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

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

If P&M acquires the right to mine the private coal shown in Figure 2-2, alluvial sediments in Little Youngs Creek and Youngs Creek would be affected. When mining progresses to the point at which Little Youngs Creek and Youngs Creek must be diverted away from the operation, the affected alluvial materials would be selectively salvaged and stockpiled as they are encountered. As a result, groundwater levels in the undisturbed alluvial system would be depressed locally near the excavation. As mining progresses across the alluvial valleys, the backfill would be placed and graded to an elevation approximating the pre-mining base of alluvium and the salvaged alluvial materials would be replaced. The restored alluvial substrate and stream channels would then be reconstructed in order to restore the pre-mining hydrologic balance and the hydrologic functions of the AVF.

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

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

Montana DNRC Permit No.	Applicant	Use
W183826-00	John Willson	Stock
W183658-00	Consolidation Coal Co.	Stock

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

backfill is leached with one pore volume of water. The same conclusions were reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. Operations at the Decker Mine are located approximately six miles northeast of the proposed Ash Creek Mine (Figure 3-1).

One well, BF-1 (Figure 3-9), was installed to monitor water level and water quality in the backfill at the reclaimed Ash Creek Mine. As reported in the Ash Creek Mine's latest Annual Mining and Reclamation Report (P&M 2002), six years after backfilling of the pit the TDS concentration of the water in the backfill appears to be declining slowly and is currently fluctuating between 2,500 and 3,000 mg/L. The present TDS concentration of groundwater sampled from Dietz 1 coal monitoring well WR-48 (Figure 3-9) is approximately 1,800 mg/L (P&M 2002). Therefore, the TDS concentration observed in the Ash Creek Mine backfill is higher than that found in the undisturbed Dietz 1 coal seam aquifer, but it meets the Wyoming Class III Standards for use as stock water. The difference between the pre-mining and post-mining TDS concentrations is likely to continue decreasing over time and the mine backfill groundwater TDS can be expected to meet the pre-mining coal seams' Wyoming Class III standards for use as stock water.

The hydraulic properties of the backfill aquifer reported in permit documents and annual reports of the nearby Big Horn Coal and Decker Mines are comparable to the Fort Union coal seams. The data available indicate that the hydraulic conductivity of the backfill would be greater than or equal to pre-mining coal values, suggesting that wells completed in the backfill would provide yields greater than or equal to pre-mining coal wells.

Direct and indirect impacts to the groundwater system resulting from mining the PSO Tract would add to the cumulative impacts that would occur due to CBM development in the general area. These impacts are discussed in Section 4.8.5.

4.4.6 Alluvial Valley Floors

If P&M acquires the federal coal in the PSO Tract as proposed and subsequently applies for a permit to mine, the application submitted to the WDEQ/LQD must include an investigation to determine the presence of AVFs within the proposed permit area. Based on a previous AVF declaration made on Little Youngs Creek within the PSO No. 1 Mine permit area (Ash Creek Mining Company 1984), it is likely that portions of West Branch, Little Youngs Creek, and Youngs Creek within the proposed Ash Creek Mine permit area would have AVF characteristics. West Branch lies within the PSO Tract. Little Youngs Creek and Youngs Creek are outside of the PSO Tract, but could be affected by mining if P&M acquires the right to mine the private coal shown in Figure 2-2. The information submitted in the permit application must be sufficient to allow the WDEQ/LQD to determine if an AVF exists, identify the essential hydrologic functions and determine if the AVF is significant to farming.

Impacts to designated AVFs are generally not permitted if the AVF is determined to be significant to agriculture. AVFs that are not significant to agriculture can be disturbed during mining, but they must be restored as part of the reclamation process. In order to restore the AVF, the physical and hydrologic characteristics of the AVF must be determined.

Disruptions to streamflow, which might supply AVFs on Youngs Creek downstream of the proposed Ash Creek Mine, would not be expected to be substantial. Groundwater intercepted by the mine pits would be routed through settling ponds to meet state and federal quality criteria. Assuming settling ponds would discharge to Youngs Creek, discharges would likely increase the frequency and amount of flows in Youngs Creek, thus increasing surface water supplies to downstream AVFs. No direct, indirect, or cumulative impacts are anticipated to off-site AVFs through mining of the PSO Tract.

4.4.7 Wetlands

As discussed in Chapter 3, general jurisdictional wetland inventories were completed in 2001 on the federal coal lands being considered for exchange and a total of 6.20 acres of jurisdictional wetlands comprised of man-made stock ponds were identified. If the decision is made to complete the exchange and P&M decides to construct a new mine as proposed, formal inventories would be completed and submitted to the COE as a required part of the mine permit application. The COE regulates the discharge of dredge and fill material into wetlands and other waters of the U.S. primarily under the authority of Section 404 of the Clean Water Act.

Existing wetlands located in the PSO Tract and adjacent lands proposed for mining would be destroyed by mining operations. COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the

Clean Water Act. COE mainly uses a programmatic general permit, 99-03, to authorize surface coal mining activities in wetlands and other waters of the U.S. in Wyoming. That permit has restrictions that do not allow the realignment or channelization of perennial streams. If P&M acquires the right to mine the private coal as indicated in Figure 2-2, and if this results in a realignment or other modification of Little Youngs and Youngs Creeks, the general permit process would not apply and an individual permit would be required. That process would require that P&M consider other alternatives, including completely avoiding impacts to these creeks and other sensitive aquatic resources with mining operations.

Replacement of functional wetlands would occur in accordance with agreements developed during the permitting process with the landowners on privately-owned surface, or with the federal surface managing agency if federal surface is included. During the period of time after mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands, but replacement would be in accordance with the requirements of Section 404 of the Clean Water Act, as determined by COE.

4.4.8 Vegetation

As proposed, mining operations for the Ash Creek Mine would progressively remove the native vegetation on 2,595 acres on and near the PSO Tract. Short-term impacts associated with this vegetation removal would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat for some wildlife species as a result of reduced species diversity, particularly big sagebrush, on reclaimed lands. However, grassland-dependent wildlife species and livestock would benefit from the increased grass cover and production.

Reclamation, including revegetation of these lands, would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to four years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until the end of mining. Grazing restrictions prior to mining and during reclamation would remove up to 100 percent of the proposed mine area from livestock grazing. This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to pre-mining levels within several years following seeding with the approved final seed mixture. Wildlife use of the area would not be restricted throughout the operations.

Re-established vegetation would be dominated by species mandated in

the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the PSO Tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the pre-mining vegetation. At least 20 percent of the area would be reclaimed to native shrubs at an average density of one shrub per square meter as required by current regulations. Trees removed by mining operations would be returned to a density equal to pre-mining conditions. Estimates for the time it would take to restore trees and shrubs to pre-mining density levels range from 20 to 100 years. An indirect impact of this vegetative change could be decreased big game habitat carrying capacity. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond (a minimum of ten years), a diverse, productive, and permanent vegetative cover would be established on the PSO Tract. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed post-mining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Private landowners (Figure 3-13) would have the right to manipulate the vegetation on their lands as they desire once the reclamation bond is released.

On average, about 150 acres of surface disturbance per year of mining would occur on the PSO Tract at the proposed rate of production for the proposed Ash Creek Mine. By the time mining ceases, over 75 percent of these disturbed lands would have been reseeded. The remaining 25 percent would be reseeded during the following two to three years as the life-of-mine facilities areas are reclaimed.

The reclamation plan for the proposed Ash Creek Mine would include steps to control invasion by weedy (invasive nonnative) plant species. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land.

The climatic record of the western U.S. suggests that droughts could occur periodically during the life of the mine. Such droughts would severely hamper revegetation efforts, since lack of sufficient moisture would reduce germination and could damage newly established plants. Same-aged vegetation would be more susceptible to disease than would plants of various ages. Severe thunderstorms could also adversely affect newly seeded areas. Once a stable vegetative cover is established, however, these events would have similar impacts as would occur on native vegetation.

Changes expected in the surface water network as a result of mining and reclamation would affect the reestablishment of vegetation patterns on the reclaimed areas to some extent. The post-mining maximum slope would be 20 percent in accordance with WDEQ policy. The average reclaimed slope would not be known until WDEQ's

technical review of the permit application is complete. No substantial changes in average slope are predicted.

Following reclamation, the PSO Tract would be primarily mixed prairie grasslands with graminoid/forb-dominated areas, and the overall species diversity would be reduced, especially for the shrub component. As indicated previously, following reclamation bond release, management of the privately-owned surface would revert to the private surface owner, who would have the right to manipulate the reclaimed vegetation.

Jurisdictional wetlands would fall under the jurisdiction of the COE. Detailed wetland mitigation plans would be required at the permitting stage to ensure no net loss of jurisdictional wetlands on the project area. Functional wetlands may be restored in accordance with the requirements of the surface landowner. There are 6.41 acres of public lands included in the PSO Tract, the remainder of the surface of the tract is privately owned.

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

4.4.9 Threatened, Endangered, Proposed, and Candidate Plant Species, BLM Sensitive Species, and State Species of Special Concern

Refer to Appendix E.

4.4.10 Wildlife

Local wildlife populations are directly and indirectly impacted by mining. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. The indirect impacts are longer term and may include a reduction in big game carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

Under the Proposed Action, big game would be displaced from

portions of the PSO Tract to adjacent ranges during mining. Pronghorn would be most affected; however, none of the area within two miles of the PSO Tract has been classified as crucial or critical pronghorn habitat. Mule deer would not be substantially impacted, given that they are scattered throughout the site and there is suitable habitat available in adjacent areas. White-tailed deer would not be affected, as they are uncommonly observed on the PSO Tract and adjacent areas. Big game displacement would be incremental, occurring over several years and allowing for gradual changes in distribution patterns. Big game residing in the adjacent areas could be impacted by increased competition with displaced animals. Noise, dust, and associated human presence would cause some localized avoidance of foraging areas adjacent to mining activities. On existing surface mines, however, big game have continued to occupy areas adjacent to and within active mine operations, suggesting that some animals may become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. There would be more restrictions on big game movement on or through the tract, however, due to additional fences, spoil piles, and pits related to mining. During winter storms, pronghorn may not be able to negotiate these barriers. SMCRA requires that fences, overland conveyors, and other potential barriers be designed to permit passage for large animals [30 CFR 816.97(e)(3)]. WDEQ guidelines require fencing to be designed to permit pronghorn passage to the extent possible.

The WGFD has reviewed monitoring data which has been collected on mine sites in Wyoming for big game species and the monitoring requirements for big game species on those mine sites. Their findings concluded that the monitoring had demonstrated the lack of impacts to big game on existing mine sites. No severe mine-caused mortalities have occurred and no long-lasting impacts on big game have been noted on existing mine sites. The WGFD therefore recommended that big game monitoring be discontinued on all existing mine sites. New mines would be required to conduct big game monitoring if located in crucial winter range or in significant migration corridors, neither of which apply to the PSO Tract.

There would be an increase in road kills related to mine traffic.

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

Medium-sized mammals (such as coyotes, foxes, skunks, and raccoons) would be temporarily displaced to other habitats by mining, potentially resulting in

increased competition and mortality. However, these animals would quickly rebound on reclaimed areas, as forage developed and small mammal prey species recolonized. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many retreat into burrows when disturbed. Therefore, populations of such prey animals as voles, mice, chipmunks, prairie dogs, and rabbits would decline during mining. However, these animals have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that reclamation objectives to encourage the decolonization of small mammal communities are being achieved (Shelley 1992). The study evaluated sites at five mines in Campbell County, Wyoming.

Mining the PSO Tract would not impact regional raptor populations; however, individual birds or pairs may be impacted. Numerous raptor species have been observed on or adjacent to the PSO Tract, as there is abundant suitable nesting habitat (bluffs and tall trees) in the area. As noted in Section 3.4.10.4, a total of six raptor species (the great horned owl, red-tailed hawk, golden eagle, prairie falcon, Cooper's hawk, and American kestrel) have been identified nesting within one mile of the area proposed for mining. In 2001, six nest sites in this area were active and included two golden eagle nests, three red-tailed hawk nests and one great horned owl nest. Two raptor species (the red-tailed hawk and the great horned owl) have been recorded nesting on the PSO Tract, both of which fledged young in 2001. P&M monitors territorial occupancy and nest productivity within the permit area for the reclaimed PSO No.1/Ash Creek Mine site and a one-mile radius in the winter, spring, and early summer. Mining activity could cause raptors to abandon nests proximate to disturbance. USFWS recommends a one-mile buffer around all ferruginous hawk nests. USFWS and WDEQ/LQD approval would be required before mining would occur within buffer zones for future or adjacent active raptor nests. Mine-related disturbances would not be allowed to encroach in the near vicinity of any active raptor nest from March until hatching, and disturbances near raptor nests containing nestlings would be strictly limited to prevent danger to, or abandonment of, the young. These and other raptor mitigation measures and a raptor monitoring plan, as required by the USFWS and WDEQ/LQD, are part of the Proposed Action. Mining near raptor territories would minimally impact availability of raptor forage species. During mining, nesting habitat would be created by the excavation process (highwalls), as well as through enhancement efforts (nest platforms and boxes). SMCRA requires use of the best technology currently available for protection of fish, wildlife, and related environmental values, including ensuring that electric powerlines and other transmission facilities are designed and constructed to

minimize electrocution hazards to raptors [30 CFR 816.97(e)(1)]. After mining, the reclamation plan would reestablish the ground cover necessary for the return of a suitable prey base.

As discussed in Section 3.4.10.5, sage grouse are yearlong residents and are found on the PSO Tract and adjacent lands. The lek within the federal coal lands being considered for trade (Figure 3-12), was active intermittently from 1979 through 2002 with a maximum number of males recorded at 31 in 1982. The impacts of mining the PSO Tract on this lek would be the temporary loss of nesting habitat and disturbance to breeding activities when the mining operations approach to within close proximity of the birds' strutting ground. Monitoring of sage grouse activities indicates that the birds frequently change lek sites. It is likely that if mining activities disturb a lek, sage grouse would use an alternate lek site for breeding activities. With breeding and nesting areas impacted, some disruption in breeding and nesting activity may be anticipated until the birds move to new breeding and nesting locations. Since this lek has only exhibited a maximum of about 20 males over the past several years, impacts from this mining activity to the overall population in Wyoming and Montana is expected to be minimal. During reclamation, shrubs, including big sagebrush, would be reestablished on reclaimed lands; reclaimed lands would be graded to create swales and depressions; and monitoring of sage grouse activity would continue in the area before, during, and after mining. These and other measures would be further developed in the WDEQ/LQD Permit to Mine application.

Other upland game bird species (i.e., sharp-tailed grouse, wild turkey, pheasant, and gray partridge) that are found on the PSO Tract would be temporarily displaced to adjacent habitats during mining. These birds are highly mobile and can move to undisturbed areas. Their populations are relatively low; therefore, their relocations should not increase competition and mortality.

Displaced songbirds including those Migratory Bird Species of Management Concern (discussed in Section 3.4.10.6), would have to compete for available adjacent territories and resources when their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. Losses would also occur when habitat disturbance coincides with egg incubation and rearing of young. Impacts of habitat loss would be short-term for grassland species, but would last longer for tree- and shrub-dependent species. Concurrent reclamation would minimize these impacts. A diverse seed mixture planted in a mosaic with a shrubland phase would provide food, cover, and edge effect. Other habitat enhancement practices include the restoration of diverse land forms, direct topsoil replacement, and the construction of brush piles, snags and rock piles. A research project on habitat

reclamation on mined lands within Campbell County, Wyoming, for small mammals and birds concluded that the diversity of song birds on reclaimed areas was slightly less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992).

Waterfowl and shorebird habitat on P&M's proposed Ash Creek Mine site is minimal, and production of these species is very limited. Mining the PSO Tract would thus have a negligible effect on migrating and breeding waterfowl. Sedimentation ponds created during mining would provide interim habitat for these fauna. WDEQ and the COE would also require mitigation of any disturbed wetlands during reclamation. If the replaced wetlands on the proposed Ash Creek Mine site do not duplicate the exact function and/or landscape features of the pre-mine wetlands, waterfowl and shorebirds could be beneficially or adversely affected as a result.

If P&M acquires the right to mine the private coal shown in Figure 2-2, a minimal amount of low-quality fish habitat within Little Youngs Creek and Youngs Creek would be impacted within P&M's proposed Ash Creek Mine area when the streams are diverted around the operation. A hydrologic control plan would be designed to prevent adverse impacts to the hydrologic balance outside the permit area, thus maintaining the quantity and quality of surface waters and the existing fish habitat upstream and downstream of the diversions. The only fish present are common, widespread, non-game species. Those portions of creeks that are disturbed during mining would be restored during reclamation.

The impacts discussed above would apply to the Proposed Action and Alternative 3. The assessment of impacts to wildlife by the mining operations at the proposed Ash Creek Mine would be addressed during the WGFD's and the WDEQ/LQD's review of the mine permit application, and within the WDEQ/LQD's permit approval process.

4.4.11 Threatened, Endangered, Proposed, and Candidate Wildlife Species, BLM Sensitive Species, and State Species of Special Concern

Refer to Appendix E.

4.4.12 Land Use and Recreation

The major adverse environmental consequences of the proposed Ash Creek Mine on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of other mineral development, particularly CBM development, on about 2,595 acres during active mining. Wildlife (particularly big game) and livestock (cattle and horses) use would be displaced while the tract is being mined and reclaimed. Adjacent landowners would be affected by the presence of a surface coal mine and associated operations on the PSO Tract.

Sections 3.4.11 and 4.4.2 of this document address the existing CBM wells within and adjacent to the

federal coal lands being considered for exchange. Well location information, federal oil and gas ownership, and federal oil and gas lessee information are presented in Figure 3-14 and Table 3-12. CBM is currently being produced on the PSO Tract and on lands adjacent to the PSO Tract. Any well facilities associated with drilling and producing CBM would have to be removed prior to mining. Royalties, income, and taxes would be lost if the CBM is not recovered prior to mining or if coal is not recovered due to conflicts. CBM that is not recovered prior to mining is vented to the atmosphere. The costs of agreements between the CBM and the coal operators would be factored into the fair market value determination. In this case, the fair market value determination would affect how much federal coal would be offered for exchange with the P&M properties.

Within the boundary of the federal coal being considered for exchange are 6.41 acres of federal land (Lot 1 of Section 15, T.58N., R.84W., shown in Figure 3-13). This area would be removed from public access if the exchange is completed under the Proposed Action.

Hunting on the PSO Tract would be eliminated during mining and reclamation. P&M owns the surface of most of the PSO Tract (Figure 3-13) and does not presently allow hunting on their surface.

Following reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses. There are no USFS surface lands and only 6.41 acres of BLM surface lands included in the PSO Tract, but the reclamation standards required by SMCRA and Wyoming State law meet the standards and guidelines for healthy rangelands for public lands administered by the BLM in the State of Wyoming. Following reclamation bond release, management of the privately-owned surface would revert to the private surface owner.

4.4.13 Cultural Resources

The PSO Tract and the adjacent surface lands owned by P&M were subjected to a Class III cultural inventory and assessment in August 2000.

Table 3-13 (Section 3.4.12) summarizes the distribution of cultural sites by type. Data recovery plans are required for those sites recommended eligible to the NRHP following testing and consultation with the SHPO. Until consultation with SHPO has occurred and agreement regarding NRHP eligibility has been reached, all sites should be protected from disturbance.

Consultation with SHPO would be completed during the mining permit approval process. Sites that are determined to be unevaluated or eligible for the NRHP through consultation would receive further protection or treatment. If unevaluated sites cannot be avoided, they must be evaluated prior to disturbance. If eligible sites cannot be avoided, a data recovery plan must be implemented prior to disturbance. Ineligible properties

may be destroyed without further work.

The eligible sites on the PSO Tract which cannot be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation, or data recovery plan is developed to address the impacts to the sites. The lead federal and state agencies would consult with Wyoming SHPO on the development of such plans and the manner in which they are carried out.

Cultural resources adjacent to the mine areas may be impacted as a result of increased access to the areas. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits outside of, but adjacent to, mine permit areas.

4.4.14 Native American Concerns

No sites of Native American religious or cultural importance are known to occur on the PSO Tract. Native American groups can request additional information and can tour the area upon request. If sites or localities of religious or cultural importance are identified, appropriate action must be taken to address concerns related to those sites.

4.4.15 Paleontological Resources

No unique or significant paleontological resources have been identified or are suspected to exist on the PSO Tract. The likelihood of encountering significant paleontological resources is very small.

4.4.16 Visual Resources

Mining activities on most of the PSO Tract would be partially visible from the major travel route in the area (Wyoming State Highway 338), and to adjacent landowners. The mining operation would be largely concealed by the surrounding rugged terrain, but may adversely impact the viewshed of adjacent and nearby landowners.

No visual resources have been identified on or near the PSO Tract that are unique to this tract as compared to the surrounding area. The mining operations would affect landscapes classified as VRM Class II by BLM. There are 6.41 acres of BLM land included in the PSO Tract; however, the proposed facilities would be located on private lands. The Sheridan County Growth Management Plan identifies the need for an inventory of existing resources, including scenic resources, and the utilization of this information in the review and evaluation of proposed developments. Currently no procedure or ordinance exists that provides for this evaluation and review.

As discussed previously, P&M's current proposal includes an overland conveyor, which would be used to transport the coal from the mine area to a loadout facility located beside the BNSF mainline railroad tracks that are located

approximately four miles south of the PSO Tract, near the recently reclaimed Big Horn Coal Mine's coal loadout facility. If the land exchange is completed and if P&M proceeds with its proposal to open a surface coal mine, the exact location of this conveyor would be determined through access negotiations with the adjacent surface landowners. Due to the area's rugged terrain and relatively remote location, it would be possible to locate the conveyor so that it is largely concealed from general view, but it might be visible to nearby landowners in the area. Only where the conveyor would crest over hilltops should it be visible from any major travel routes in the area.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) than the surrounding undisturbed terrain, and sagebrush and trees would not be as abundant for several years; however, within a few years after reclamation, the mined land would not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

4.4.17 Noise

Noise levels on the PSO Tract would be increased considerably by mining activities such as blasting, loading, hauling, and coal crushing. No rail car loading would take place on the proposed Ash Creek Mine site. P&M proposes to use an overland conveyor to transport the coal to a unit train loadout facility on the BNSF mainline about 4.5 miles south of the mining operation. This would reduce noise levels from operations on the tract, but would increase noise levels along the route of the conveyor.

The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 dBA prevents hearing loss and that a level below 55 dBA, in general, does not constitute an adverse impact. OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) which determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. Explosives would be used during mining to fragment the overburden and coal and facilitate their excavation. The air overpressure created by such blasting is estimated to be 123 dBA at the location of the blast. At a distance of approximately 1,230 ft, the intensity of this blast would be reduced to 40 dBA. According to the scale shown in Figure 3-16, this would correspond to a noise level equivalent to a quiet home during the evening. There are several occupied dwellings located roughly one-quarter mile (1,320 ft) away from the PSO Tract.

Because of the remoteness of the mine site and associated overland conveyor, noise would have little off-site effect. Local residents in the Ash Creek and Youngs Creek areas would be affected by the increased noise levels caused by the mining operations and the overland conveyor. The nearby dwellings could experience increases in noise related to mining operations. One

dwelling, which is located along the proposed route for the overland conveyor, could experience adverse noise impacts due to the conveyor. Wildlife in the immediate vicinity of mining may be adversely affected. Observations at surface coal mines in the PRB indicate that wildlife generally adapt to increased noise associated with active coal mining. After mining and reclamation are completed, noise would return to pre-mining levels.

4.4.18 Transportation Facilities

The only potential new or reconstructed transportation facilities required under the Proposed Action would be the overland conveyor and coal loadout facilities that are proposed for construction south of the new mine. A proposed location for the overland conveyor and coal loadout facility is shown in Figure 3-15. As discussed previously, if the exchange is completed and if P&M proceeds with its proposal to open a surface coal mine, the exact location of this conveyor and loadout facility would be determined through right-of-way negotiations with the adjacent surface landowners. Essentially all of the coal mined would be transported by rail. Vehicular traffic to and from the mine would increase from existing levels since the employees would use State Highway 338, the same route used by employees at the Decker and Spring Creek Mines.

The Wyoming Department of Transportation routinely monitors traffic volumes on area highways, and if traffic exceeds design standards improvements are made. BNSF has upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected from the PRB with or without the operation of the proposed Ash Creek Mine. Pipelines for collecting and transporting CBM are constructed as the existing and proposed CBM wells start producing. Any relocation of pipelines and utility lines associated with CBM production would be handled according to specific agreements between P&M, if the exchange is completed and P&M proceeds with its proposal to open a surface coal mine, and utility owners if the need arises.

4.4.19 Socioeconomics

Exchange of the federal coal and subsequent acquisition of private coal adjacent to the PSO Tract by P&M would facilitate the opening of a new mine. Projected coal production would be 10 million tpy by the end of the third year and production would continue at that rate for another 14 years under the Proposed Action.

P&M estimates that a selling price of $8.00 per ton would be needed to justify the expense of opening a new mine. At this price, the revenue from the sale of the recoverable coal from the proposed Ash Creek Mine would total $1,164 million (145.5 million tons of coal) based on the mining scenario shown in Figure 2-2. Some of the money from the sale of this coal would be paid to state and local governments in the form of taxes, as discussed below.

If the exchange is completed as proposed, P&M would acquire ownership of the federal coal estate included in the PSO Tract. If P&M proceeds with their proposal to open a surface coal mine on the PSO Tract, there would be no royalties paid to either the state or federal governments when the coal is mined. If the federal coal reserves included in the tract were to be leased and mined, the federal government would receive 12.5 percent royalty when the coal is mined, which would be split with the state. Based on P&M's estimate of the amount of recoverable federal coal included in the PSO Tract and the coal price assumptions stated above, if the federal coal included in the tract was leased and mined, this would represent approximately $107 million in royalty payments, which would be split with the state. If the coal was competitively leased, the federal government would also hold a competitive lease sale, and would receive a bonus when the coal is leased. The bonus payment at the time of the lease sale would have to meet or exceed the fair market value of the coal included in the tract, as determined by BLM. Recent bonus payments for federal coal leased to existing mines in the eastern PRB have reached as high as $0.706 per ton. There was one recent competitive sale of federal coal in the western portion of the PRB, in Montana, and the bonus bid for that sale was approximately $0.11 per ton. This sale, which was held in 2000, involved 150 acres of federal coal resources adjacent to the Spring Creek Mine. The fair market value of the coal in the PSO Tract would be expected to be lower than the fair market value of the coal in a maintenance tract for an existing mine due to consideration of the capital costs that a new mine would have to incur in order to begin mining and shipping coal. Furthermore, the absence of applications to lease federal coal and the lack of other mines that might be interested in acquiring federal coal in the Sheridan area indicates that there would be limited competitive interest in this area, if a coal lease sale was held.

According to a study done by the University of Wyoming (UW 1994), the State of Wyoming received about $1.10 per ton from the sale of PRB coal produced in 1991. The taxes and royalties included in this calculation were severance taxes, ad valorem taxes, sales and use taxes, and the state's share of federal royalty payments on production. Since there would be no federal royalties on the exchanged coal, the revenues to the state for the Ash Creek Mine, as proposed, would be somewhat less than this amount. In 1994, when the University of Wyoming study was done, the average price for PRB coal was $5.62 per ton (WSGS 2001a). Most of the coal sold in 1994 was federal coal, and the state's share of federal royalty was 6.25 percent of the sale price ($5.62), or about $0.35 per ton. Thus, without the federal royalties, the net benefit to Wyoming (in the form of revenues from severance taxes, ad valorem taxes, and sales and use taxes) in the 1994 UW study would have been about $0.75 per ton, which would be about $80 million based on 107 million tons of recoverable coal in

the PSO Tract. In addition, the state would receive AML fees of $0.35 per ton of recoverable coal minus the federal government's 50 percent share, which would be $19 million. Therefore, the estimated total direct return to the State of Wyoming from the production of coal in the PSO Tract, in current dollars would be about $99 million.

If the Ash Creek Mine is operated as described under the Proposed Action and annual coal production is 10 million tons, P&M anticipates that the average number of employees at the Ash Creek Mine would be 70 over the 17 years the property would be mined. These 70 persons would represent about 0.5 percent of the 14,288 persons in the December 2002 labor force in Sheridan County (Wyoming Department of Employment 2003). The December 2002 unemployment in Sheridan County was about 685. No additional demands on the existing infrastructure or services in these communities would be expected because no influx of residents would be needed to fill new jobs. The potential contributions of the proposed Ash Creek Mine to Sheridan County would offset the closure of the Big Horn Coal Mine in 2000. As discussed in Chapter 3, production at the Big Horn Mine peaked in 1981 at four million tpy and employment peaked at about 300 (Sheridan Press 1994). Assessed valuation of the mine dropped from a peak of $65 million to $2.7 million in 1994.

At a production rate of 10 million tpy and a sale price of $8.00 per ton, the value of annual production at the Ash Creek Mine would be $80 million. In 2002, the assessed valuation of Sheridan County was $225,468,629, on which the total property tax levy was $15,345,534 (Wyoming Taxpayer's Association 2003). The total mill levy was therefore 68.1. The value of coal production (10 million tpy at $8.00 per ton) at the Ash Creek Mine would represent a 35.5 percent increase over the 2002 assessed valuation of the county and would therefore increase property taxes by $5.4 million to about $20.8 million. The county would also see increased sales and use tax revenues, particularly from goods purchased during mine construction. The state would realize revenues from severance taxes, a portion of which is returned to local governments. The severance tax rate on surface coal is seven percent (Wyoming Department of Revenue 2003). Under the Proposed Action severance taxes would total about $5.6 million per year.

If the exchange is completed and P&M proceeds with its proposal to open a surface coal mine on the PSO Tract, the overall impact to Sheridan County would be beneficial in the form of increased employment and assessed valuation and taxes, as discussed above. The opening of a surface coal mine would likely have adverse socioeconomic impacts on the adjacent landowners, however, as was pointed out in several comments received on the Draft EIS. The adjacent landowners would be likely to experience depreciation in their property values as a result of the proximity of their property to a

surface coal mining operation and the associated facilities, noise, air quality emissions, traffic, etc.

During scoping, one commenter asked what the tax impacts would be if the P&M lands are exchanged and become federally owned. At present, property taxes paid to the counties by P&M include about $440 per year to Lincoln County (Bridger lands), $660 per year to Carbon County (JO Ranch lands), and $3,600 to Sheridan County (Welch lands). These property taxes would no longer be payable by P&M to the respective counties if the exchange is completed.

These tax payments would be partially offset by Payments in Lieu of Taxes (PILT) and 25 Percent Funds. BLM and USFS distribute these funds to units of local government (e.g., counties) that contain certain federally owned lands within their boundaries. The amount of the PILT payments is determined by several codified formulas (USC 6901-07) and is designed to supplement other federal land revenue-sharing payments that county government may be receiving.

The 25 Percent Funds are paid by the USFS (25 percent of National Forest Fund receipts) to units of local government as proxies for property taxes on the land.

Total PILT payments to Wyoming in 1997 were about $7.5 million. Payments to Wyoming from National Forest receipts totaled $1.8 million that year. Lincoln County, where the Bridger lands are located, received $93,822.86 in payments from the USFS in 1997 (USFS April 2003).

The PILT and 25 Percent Fund payments would increase incrementally if these private lands exchanged into public ownership, but the payments would not totally offset the current property taxes on these parcels. As a general rule, it has been found that the overall tax liability on Federal lands is almost three times the Federal payments (Schuster et al. September 1999). If this relationship holds true in this case, the net loss of property taxes to the respective counties (assuming federal payments would be one-third of taxes) would be $290 to Lincoln County, $440 to Carbon County, and $2,400 to Sheridan County.

Issues relating to the social, cultural, and economic well-being and health of minorities and low-income groups are termed Environmental Justice issues. In reviewing the impacts of the Proposed Action on socioeconomic resources, surface water and groundwater quality, air quality, hazardous materials, or other elements of the human environment in this chapter, it was determined that potentially adverse impacts do not disproportionately affect Native American tribes, minority groups and/or low-income groups.

With regard to Environmental Justice issues affecting Native American tribes or groups, the analysis area contains no tribal lands or Native American communities, and no treaty rights or Native American trust resources are

known to exist for this area. The northwest corner of the federal coal tract P&M wants to acquire is close to, but is not directly contiguous with, the southeast corner of the Crow Indian Reservation (Figure 3-1).

Implementing any of the alternatives would have no effects on Environmental Justice issues, including the social, cultural, and economic well-being and health of minorities and low income groups within the general analysis area.

4.4.20 Hazardous and Solid Waste

The types of solid wastes that would be generated in the course of mining the PSO Tract are described in Chapter 2. The procedures that would be used for handling hazardous and solid waste at the proposed Ash Creek Mine are also described in Chapter 2. Wastes generated by mining the PSO Tract would be handled in accordance with the existing regulations as described in Chapter 2.

4.5 No-Action Alternative

Under the No-Action Alternative, the exchange would not be completed. P&M would retain ownership of the lands that they have offered for exchange. The federal coal included within the PSO Tract would remain in federal ownership. The federal coal being considered for exchange could be leased and mined in the future; however, for the purposes of this analysis, the No-Action Alternative assumes that these federal coal lands would not be mined in the foreseeable future. This assumption allows a comparison of the economic and environmental consequences of mining these lands versus not mining them.

Under the No-Action Alternative, the Welch lands, JO Ranch lands, and Bridger lands would remain in private ownership. The Bridger lands would remain private in-holdings in the BTNF and the BLM Pinedale Field Area. The JO Ranch lands, including the JO Ranch buildings, which are eligible for National Historic Site status, would remain private in-holdings in the BLM Rawlins Field Area. The Welch lands, which represent a unique opportunity for public access to the Tongue River in Wyoming outside of the Big Horn National Forest, would remain in private hands. According to comments received from P&M, if the exchange is not completed, they would consider subdividing the properties in order to maximize their value and marketing the subdivided tracts to the public.

Under the No-Action Alternative the Ash Creek Mine would not be opened as proposed. The impacts described on the preceding pages and in Table 2-3 to topography and physiography, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered, proposed, and candidate species, sensitive species and species of special interest to the state, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics

would not occur on the PSO Tract. Furthermore, the proposed Ash Creek Mine would not contribute to the general nature and magnitude of cumulative impacts in the PRB.

The economic benefits that would be derived from mining the PSO Tract would be lost.

4.6 Regulatory Compliance, Mitigation, and Monitoring

No impacts requiring mitigation or monitoring have been identified related to BLM and USFS acquisition of the Bridger or JO Ranch lands. If BLM acquires the portion of the Welch lands containing the underground coal fire, then both mitigation and monitoring of the impacts of that fire could be required. Management practices, mitigation measures, and monitoring requirements would be determined through additional NEPA analysis and planning decisions, if the exchange is completed. Some of the options that BLM would consider for managing the lands occupied by the coal fire are discussed in Appendix D.

In the case of the PSO Tract, SMCRA and state law require a considerable amount of compliance requirements, mitigation and monitoring for surface coal mining operations. Measures that are required by regulation are considered to be part of the Proposed Action. If the exchange is completed and P&M decides to mine the coal beneath the PSO Tract, these requirements, mitigation plans, and monitoring plans would be part of a mining and reclamation plan covering the proposed Ash Creek Mine. This mining and reclamation plan would have to be approved before mining could occur on the PSO Tract. The major mitigation measures and monitoring measures that are required by state or federal regulation are summarized in Table 4-8. More specific information about some of these mitigation and monitoring measures are described in the following sections of this document:

- Section 4.4.1, restoration of topography to approximate original contour;
- Section 4.4.1, restoration of approximate original drainage pattern and replacement of stock ponds;
- Section 4.4.2, management plan for handling of unsuitable overburden material;
- Section 4.4.3, special handling of soil or overburden materials containing potentially harmful chemical constituents;
- Section 4.4.4, air quality monitoring practices and application of BACT for mitigation of air quality impacts;
- Section 4.4.5 surface water hydrologic control measures;
- Section 4.4.5, reconstruction of irrigation systems and the acreage of irrigated land;
- Section 4.4.5, groundwater quantity and quality monitoring measures;
- Section 4.4.5, mitigation for interruption, discontinuation, or diminishment of existing

Table 4-8. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action).

Resource	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	Monitoring[1]
Topography & Physiography	Restoring to approximate original contour or other approved topographic configuration.	LQD checks as-built vs. approved topography with each annual report.
Geology & Minerals	Identifying & selectively placing or mixing chemically or physically unsuitable overburden materials to minimize adverse effects to vegetation or groundwater.	LQD requires monitoring in advance of mining to detect unsuitable overburden.
Soil	Salvaging soil suitable to support plant growth for use in reclamation; Protecting soil stockpiles from disturbance and erosional influences; Selectively placing at least four ft of suitable overburden on the graded backfill surface below replaced topsoil to meet guidelines for vegetation root zones.	Monitoring vegetation growth on reclaimed areas to determine need for soil amendments. Sampling regraded overburden for compliance with root zone criteria.
Air Quality	Dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air; Using particulate pollution control technologies; Using work practices designed to minimize fugitive particulate emissions; Using EPA- or state-mandated BACT, including: Fabric filtration or wet scrubbing of coal storage silo and conveyor vents, Watering or using chemical dust suppression on haul roads and exposed soils, Containment of truck dumps and primary crushers, Covering of conveyors, Prompt revegetation of exposed soils, High efficiency baghouses on the crusher, conveyor transfer, storage bin and train loadout, meeting a standard of 0.01 grains per dry standard cubic foot (dscf) of exit volume, Watering of active work areas, Reclamation plan to minimize surface disturbances subject to wind erosion, Paving of access roads.	On-site air quality monitoring for PM_{10} or TSP; Off-site ambient monitoring for PM_{10} or TSP; On-site compliance inspections.
Surface Water	Building and maintaining sediment control ponds or other devices during mining; Restoring approximate original drainage patterns during reclamation; Restoring stock ponds and playas during reclamation.	Monitoring storage capacity in sediment ponds; monitoring quality of discharges; monitoring stream-flow and water quality.

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action) (Continued).

Resource	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	Monitoring[1]
Groundwater Quantity	Evaluating cumulative impacts to water quantity associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity.	Monitoring wells track water levels in overburden, coal, interburden, underburden, & backfill.
Groundwater Quality	Evaluating cumulative impacts to water quality associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality.	Monitoring wells track water quality in overburden, coal, interburden, underburden, & backfill.
Alluvial Valley Floors	Identifying all AVFs that would be affected by mining; Determining significance to agriculture of all identified AVFs affected by mining (WDEQ); Protecting downstream AVFs during mining; Restoring essential hydrologic function of all AVFs affected by mining.	Monitoring to determine restoration of essential hydrologic functions of any declared AVF.
Wetlands	Identifying all wetlands that would be affected by mining; Identifying jurisdictional wetlands (COE); Replacing all jurisdictional wetlands that would be disturbed by mining; Replacing functional wetlands as required by surface managing agency or surface land owner.	Monitoring of reclaimed wetlands using same procedures used to identify pre-mining jurisdictional wetlands.
Vegetation	Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area; Reclaiming 20 percent of reclaimed area with native shrubs at a density of one per square meter; Controlling erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures; Chemically and mechanically controlling weed infestation; Direct hauling of topsoil; Selectively planting shrubs in riparian areas; Planting sagebrush; Creating depressions and rock piles; Using special planting procedures around rock piles; Posting reclamation bond covering the cost of reclamation.	Monitoring of revegetation growth & diversity until release of final reclamation bond (minimum 10 years). Monitoring of erosion to determine need for corrective action during establishment of vegetation. Use of controlled grazing during revegetation evaluation to determine suitability for post-mining land uses.

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action) (Continued).

Resource	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	Monitoring[1]
Wildlife	Restoring pre-mining topography to the maximum extent possible; Planting a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife; Designing fences to permit wildlife passage; Raptor-proofing power transmission poles; Creating artificial raptor nest sites; Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land; Cottonwood plantings along reclaimed drainages; Replacing drainages, wetlands, and AVFs disturbed by mining; Reducing vehicle speed limits to minimize mortality; Instructing employees not to harass or disturb wildlife; Preparing raptor mitigation plans.	Baseline & annual wildlife monitoring surveys; Monitoring for Migratory Bird Species of Management Concern in Wyoming.
Threatened, Endangered, Proposed, and Candidate Species	Avoiding bald eagle disturbance; Restoring bald eagle foraging areas disturbed by mining; Restoring mountain plover habitat disturbed by mining; Using raptor safe power lines; Surveying for Ute ladies' tresses; Surveying for mountain plover; Searching for black-footed ferrets if prairie dogs move onto tract; Surveying for black-tailed prairie dog; Same as Wildlife Resource above.	Baseline and annual wildlife monitoring surveys.
Land Use	Suitably restoring reclaimed area for historic uses (grazing and wildlife).	Monitoring of controlled grazing prior to bond release evaluation.
Cultural Resources	Conducting Class I & III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings; Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP; Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan; Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations; Instructing employees of the importance of and regulatory obligations to protect cultural resources.	Monitoring of mining activities during topsoil stripping; cessation of activities and notification of authorities if unidentified sites are encountered during topsoil removal.

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action) (Continued).

Resource	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	Monitoring[1]
Native American Concerns	Notifying Native American tribes with known interest in this area of leasing action and request for help in identifying potentially significant religious or cultural sites.	No specific monitoring program.
Paleontological Resources	Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining.	No specific monitoring program.
Visual Resources	Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species.	No specific monitoring program.
Noise	Protecting employees from hearing loss.	MSHA inspections.
Transportation Facilities	Relocating existing pipelines, if necessary, in accordance with specific agreement between pipeline owner and coal lessee.	No specific monitoring program.
Socioeconomics	Paying royalty and taxes as required by federal, state, and local regulations.	Surveying and reporting to document volume of coal removed.
Hazardous & Solid Waste	Disposing of solid waste and sewage within permit boundaries according to approved plans; Storing and recycling waste oil; Maintaining of files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining; Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable existing or hereafter promulgated federal, state, and government requirements; Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended; Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; Preparing emergency response plans.	No specific monitoring other than required by these other regulations and response plans.

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

water well rights by mining operations;
- Section 4.4.6, restoration of AVFs impacted by mining;
- Section 4.4.7, identification and replacements of jurisdictional wetlands impacted by mining;
- Section 4.4.8, restoration of vegetation using approved reclamation seed mixtures;
- Section 4.4.8, plans for control of invasive, nonnative plant species;
- Section 4.4.10, fencing designed to permit pronghorn passage;
- Section 4.4.10, notification and mitigation measures to protect active raptor nests and nest productivity;
- Section 4.4.10, use of electric powerlines and transmission facilities designed and constructed to minimize electrocution hazards to raptors;
- Section 4.4.10, mitigation measures to minimize habitat loss impacts to songbirds;
- Section 4.4.13, protection of cultural resources that are recommended eligible for or of undetermined eligibility for the NRHP; and
- Appendix E, protection of threatened and endangered species.

In general, the levels of mitigation and monitoring required for surface coal mining by SMCRA and Wyoming state law are more extensive than those required for other surface disturbing activities; however, concerns are periodically identified that are not monitored or mitigated under existing procedures. One issue of recent concern has been the release of NO_x from blasting and the resulting formation of low-lying, reddish brown-colored clouds that can be carried outside the mine permit areas by wind, as discussed in Section 4.4.4. After these clouds were identified as a potential health concern in the area of the Wyoming PRB surface coal mines, a monitoring program measuring NO_2 concentrations in areas accessible to the public near PRB coal mining operations was conducted in 1999. WDEQ has directed some PRB coal mines to take steps designed to mitigate the effects of NO_2 emissions during overburden blasting. The steps that may be required include: public notifications (in the form of warning signs along public roadways, for example); temporary closure of public roadways near a mine during and after a blast; establishment of safe set-back distances from blasting areas; prohibiting blasting when wind direction is toward a neighbor; prohibiting blasting during temperature inversions; establishment of monitoring plans; estimation of NO_2 concentrations; and development of blasting procedures that will protect public safety and health. Some mine operators in the PRB have voluntarily implemented various measures designed to control/limit public exposure to NO_2 emissions and to reduce short-term NO_2 releases associated with overburden blasting.

As discussed in Section 4.4.4, the likelihood that there would be a high risk posed by the release of NO_2

from overburden blasting at the Ash Creek Mine is minimal based on the proposed type of mining and the nature of the overburden.

4.7 Residual Impacts

Residual impacts are unavoidable impacts that cannot be mitigated and would therefore remain if the exchange is completed.

4.7.1 Topography and Physiography

No adverse residual topographic or physiographic impacts have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, topographic moderation would be a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

4.7.2 Geology and Minerals

No adverse residual geologic impacts have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, the geology from the base of the Dietz 3 coal to the surface would be subject to substantial, permanent change. CBM resources not recovered from the Dietz 1 and Dietz 3 seams in the mined areas prior to mining would be permanently lost.

4.7.3 Soils

No adverse residual impacts to soils have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, existing soils in the area of disturbance would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alteration of soil characteristics.

4.7.4 Air Quality

No adverse residual impacts to air quality have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, no residual impacts to air quality would occur following mining.

4.7.5 Water Resources

No adverse residual impacts to water resources have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, the post-mining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Water level and water quality in the backfill would be suitable to provide water to wells for livestock use, but would be different from pre-mining conditions. No residual impacts to

the replaced alluvial aquifer and alluvial groundwater would be expected. No residual impacts to the surface water system would be expected.

4.7.6 Alluvial Valley Floors

No adverse residual impacts to AVFs have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, no residual impacts to AVFs would be present following mining.

4.7.7 Wetlands

No adverse residual impacts to wetlands have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, replacement of jurisdictional wetlands that would be affected by mining would be required. Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the pre-mining wetland, but all wetland replacement plans would be approved by COE.

4.7.8 Vegetation

No adverse residual impacts to vegetation have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed as proposed, reclaimed vegetative communities may never completely match the surrounding native plant community.

4.7.9 Wildlife

No adverse residual impacts to wildlife have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed to near original condition as proposed, there would be some residual wildlife impacts. The topographic moderation would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species.

4.7.10 Threatened, Endangered, Proposed, and Candidate Species

No adverse residual impacts to threatened, endangered, proposed, and candidate plant or animal species, BLM Sensitive Species, and USFS Sensitive Species have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed, no residual impacts to threatened, endangered, proposed, and candidate plant or animal species, BLM Sensitive Species, and State Species of Special Concern are expected.

4.7.11 Land Use and Recreation

Any existing land use agreements between the private landowner and land users, such as grazing leases

or recreational access, would be permanently changed on the Bridger lands, JO Ranch lands, and Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed, no residual impacts to land use and recreation are expected.

4.7.12 Cultural Resources

No adverse residual impacts to cultural resources have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed, cultural sites that are determined to be eligible for the NRHP and that cannot be avoided would be destroyed by surface coal mining after data from those sites are recovered. Sites that are not eligible for the NRHP would be lost.

4.7.13 Native American Concerns

No residual impacts to Native American concerns have been identified.

4.7.14 Paleontological Resources

No residual impacts to significant paleontological resources would be expected.

4.7.15 Visual Resources

No adverse residual impacts to visual resources have been identified for the Bridger lands, the JO Ranch lands, or the Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined and reclaimed, no residual impacts to visual resources are expected.

4.7.16 Noise

No residual impacts to noise are expected.

4.7.17 Transportation Facilities

No residual impacts to transportation facilities are expected.

4.7.18 Socioeconomics

Current taxes paid to state and local governments by the private landowner would be permanently ended on the Bridger lands, JO Ranch lands, and Welch lands if the exchange is completed. If the PSO Tract is exchanged, mined, and reclaimed, no residual impacts to socioeconomics are expected.

4.7.19 Hazardous and Solid Waste

No residual hazardous or solid waste impacts are expected.

4.8 Cumulative Impacts

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

This section briefly summarizes the cumulative impacts that are occurring as a result of existing development in the PRB and that would be expected to occur if the exchange is completed and the coal

included in the PSO Tract is mined as proposed and if other reasonably foreseeable development in the general vicinity occurs.

Other agencies may use this analysis to make decisions related to exchanging and mining the federal coal within the PSO Tract. OSM is a cooperating agency on this EIS in order to provide input on the exchange process and the impacts of the proposed mining operation.

Other projects are in progress or are planned in the PRB. Projects that have proceeded beyond preliminary planning phases include:

- construction and operation of the Two Elk power plant, which has been proposed east of the Black Thunder Mine;
- construction and operation of the Wygen II power plant, which has been proposed near the Wyodak Mine site east of Gillette, Wyoming;
- the construction and operation of the proposed DM&E Railroad line;
- the ongoing development of CBM resources (in the Wyoming and Montana PRB); and
- ongoing federal coal leasing adjacent to existing surface coal mines.

With the exception of CBM development, which is addressed below, the impacts of completing and operating these projects would not be expected to overlap with the impacts of mining the PSO Tract because the other proposed projects would all be located in the eastern PRB.

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

- *Final Powder River Regional Coal Environmental Impact Statement*, BLM, December, 1981; and
- *Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region*, BLM, January 1984. (A final EIS was not released for the proposed Round II coal lease sale in the Powder River Region and the sale was never held.)

These regional EISs projected development levels for coal, oil and gas, and other minerals in the PRB in 1990 and 1995. In general, the current actual mineral development levels are at or below the levels predicted in the regional EISs for 1990 and 1995. For example, the 1981 EIS projected that about 384 million tons of coal would be produced by mines in the eastern PRB (Campbell and Converse Counties) in 1995. The actual 1995 coal production from the mines in the eastern PRB was about 246.5 million tons and the actual 2001 production from those mines was 354 million tons. The 1981 EIS estimated that mines in the Sheridan area (Big Horn, Decker, and Spring Creek) would produce 23.7 million tons of coal per year in

1990 and 1995. Actual 1999 and 2000 production from those mines was 22 and 21.3 million tons, respectively. The levels of production of natural gas are higher than projected in the regional EISs because CBM production was not anticipated in 1990 and 1995 in the regional EISs. CBM production levels are discussed in more detail in the section on Geology and Minerals below (Section 4.8.2).

With the completion of the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a) and the Montana *Statewide Final EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans* (BLM 2003b), the rate of CBM development is likely to increase in the general area of the PSO Tract. Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality, and wildlife are likely to occur. These potential impacts are considered in the following cumulative impact discussion for these resources.

4.8.1 Topography and Physiography

Following surface coal mining and reclamation, topography would be modified within the permit boundaries of the surface mines in the Sheridan area near the Wyoming-Montana state line, including the proposed Ash Creek Mine. The topography in the general vicinity of these surface mines is relatively diverse, ranging from the relatively flat, rolling terrain found in the lower reaches of the stream valleys to the relatively rugged terrain with steeply sloping ravines found in the uplands. After reclamation, the topography outside of the valley bottoms would be less rugged, more homogeneous and gentler. In general, pre-mining features that were more topographically unique (e.g., steeper hills and ravines, rock outcrops, etc.) would be smoothed with more uniform slopes.

The overall reduction in topographic diversity in the mine permit areas may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges are generally very large, mining activities are, in general, not located in habitats defined as crucial, and mining operations in this area are spread out rather than contiguous. The reduced relief and subdued topography could result in increased infiltration of surface water and reduced peak flows from the drainages. The reshaped land surface, being more uniform and subdued, could be less visually attractive to some observers, but these mine sites are separated by relatively rugged undisturbed topography. The construction and operation of CBM wells and associated production facilities would cause minimal overlapping topographic and/or physiographic changes.

4.8.2 Geology and Mineral Resources

The PRB coalfield encompasses an area of about 12,000 square miles. Finley and Goolsby (2000) estimate

that there are approximately 587 billion tons of coal in beds thicker than 20 ft and deeper than 200 ft in the basin. Most of the current federal coal leases in the PRB include coal with overburden thicknesses of 200 ft or less. These coal reserves represent a small percentage of the total coal reserves but a large percentage of the shallowest (hence the most economical to recover) coal reserves.

Since 1990, the Wyoming State Office of the BLM has held 15 competitive coal lease sales and issued 11 new federal coal leases containing approximately 3.178 billion tons of coal using the LBA process. The Wyoming BLM has pending applications for eight additional maintenance tracts for existing mines containing about 2.3 billion tons of coal. All of the leased tracts and pending applications are located in Campbell and Converse Counties, in the eastern portion of the Wyoming PRB. The Wyoming BLM has received no applications to lease federal coal in the western portion of the Wyoming PRB.

BLM completed an exchange in the PRB in 2000, authorized by Public Law 95-554. Under this exchange, EOG resources (formerly Belco) received a federal lease for a 106-million ton coal tract adjacent to the Buckskin Mine in exchange for the rights to a 170-million ton coal lease near Buffalo, Wyoming that is unmineable due to construction of Interstate Highway 90 (BLM 1999).

Wyoming PRB coal production in 2002 was approximately 360 million tons. The PRB mines located in Campbell and Converse Counties, Wyoming produce around 95 percent of the coal produced in the state each year (State Inspector of Mines 2002).

Currently there are no active surface mines within Sheridan County, but there are currently two surface coal mines in operation near the Wyoming-Montana state line: the Spring Creek and Decker Coal Mines (Figure 3-1). Both mines are in Big Horn County, Montana, approximately six to 10 miles northeast of the PSO Tract. Their 2002 productions and current maximum annual permitted production rates are shown in Table 4-9. Mining rates are expected to remain relatively constant (around 10 million tpy each) at both these mines in the near future, depending upon market conditions.

The total area that has been permanently reclaimed at the Big Horn Coal Mine, located south of the PSO Tract and Welch lands (Figure 3-1), is 1,490 acres. Facility areas at the Big Horn Coal Mine that will remain indefinitely occupy 120 acres (Big Horn Coal Company 2001). The total area that was reclaimed at the old Hidden Water Pits is approximately 412 acres (Tim Richmond 2001). The total area to be disturbed within the permit boundary of Spring Creek Coal is 2,212 acres, while Decker Coal is permitted to disturb 11,417 acres. Thus the total area disturbed to date or permitted to be disturbed by surface coal mining in the Sheridan area is 15,791 acres.

Table 4-9. Production of PRB Coal Mines Located in the Sheridan Coal Field Near the Wyoming-Montana State Line.

Mine Name	Mine Operator	Coal Production[1] 2002 Actual[2]	Currently Permitted[3]
Decker	Kiewit Mining Group, Inc.	10.0	16.0
Spring Creek	Kennecott Energy Co.	8.9	15.0
	Totals	18.9	31.0

1 Actual production (million tons) on left, permitted production (million tons) on right.

2 Source: Claudia Furiof, MDEQ, personal communication April 2, 2003.

3 Source: Robert Jeffrey, MDEQ, personal communication August 15, 2001. Maximum capacities per current air quality permits are shown.

The disturbance for the proposed Ash Creek Mine would be approximately 2,595 acres. This would represent a 16 percent increase in the total area disturbed by surface mining in the Sheridan area.

In the areas of coal removal, the geology has been or would be disrupted and the coal has been or would be recovered. When the overburden and topsoil are replaced, the natural stratification of these shallow geologic layers are destroyed in the area of coal removal. The backfill is a more homogenous mixture of shale, siltstone and fine-grained sandstone. The mined lands are restored to approximate pre-mining levels.

Natural gas production has been increasing in Sheridan County due to the development of CBM resources. Gas production in Sheridan County increased to 3.91 billion cubic feet in July 2002 from 0.68 million cubic feet in July 1999, a boost of 573,483 percent (WOGCC April 2003).

In 2002, natural gas production within the State of Wyoming was up 32.6 percent from 1999, reaching 1.75 trillion cubic feet. CBM production accounted for 18.7 percent of the State's total gas production that year (WOGCC April 2003). This increase in gas production is attributed to a large increase in CBM production in the PRB. The WOGCC approved 1,648 APDs in the second quarter of 2002. The total for that quarter is 1,421 less than the second quarter of 2001, but more than for the full years preceding 1997. Campbell County led with about 56 percent of the total APDs that were approved statewide in the second quarter of 2002; Sheridan and Johnson Counties combined for another 25 percent. Nearly all of the approved APDs in these three counties were for CBM tests (WSGS 2002).

Since the early 1990s, the Wyoming BLM has completed numerous EAs and two EISs analyzing CBM projects. The most recent of these are the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a) and the

Montana *Statewide Final EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans* (BLM 2003b), both of which were completed in January 2003. The project area for the Wyoming EIS includes almost eight million acres of mixed federal, state, and private lands within the Wyoming portion of the PRB. The Wyoming EIS evaluates the potential impacts of drilling, completing, operating, and reclaiming almost 39,400 new federal, state, and private CBM wells in addition to the roughly 12,100 federal, state, and private CBM wells that were already drilled or permitted when the document was prepared. The Wyoming EIS also analyzes the impacts of developing 3,200 new conventional oil and gas wells, as well as constructing, operating, and reclaiming various ancillary facilities needed to support the new CBM and conventional wells, including roads, pipelines for gathering gas and produced water, electrical utilities, and compressors. The Montana EIS considered a reasonably foreseeable development scenario of up to 16,500 producing private, state, and federal CBM wells on approximately 5.9 million acres of coal occurrence in 16 Montana counties.

CBM wells can be drilled on private and state oil and gas leases after approval by the WOGCC and the Wyoming SEO. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before CBM drilling on the federal leases can be authorized. In many areas of the PRB the coal rights are federally owned, but the oil and gas rights are privately owned. A June 7, 1999 Supreme Court decision (98-830) assigned the rights to develop CBM on a piece of land to the owner of the oil and gas rights.

CBM wells have been drilled on and around the PSO Tract in Wyoming and Montana. CBM drilling and production is expected to continue in the Ash Creek/Youngs Creek area, as well as farther north around the Decker and Spring Creek Coal Mines, farther south around the recently reclaimed Big Horn Coal Mine, and farther east.

Coal and CBM are non-renewable resources that form as organic matter decays and undergoes chemical changes over geologic time. The CBM and coal resources that are removed to generate heat and power would not be available for use in the future. No potential damages to the coal resulting from removal of the CBM and water prior to mining have been identified. The CBM operators generally do not completely dewater the coal beds to produce the CBM because that could damage fractures in the coal and limit CBM production.

4.8.3 Soils

Spring Creek and Decker Coal Mines would disturb about 13,629 acres throughout their combined lives (they would disturb about 300 acres annually during active mining at the currently planned mining rates). Approximately 2,020 acres were disturbed and 1,902 permanently reclaimed at the Big Horn Coal Mine and the Hidden

Water Pits, for a total of approximately 15,791 acres of historic and permitted surface mine disturbance in the Sheridan area. If the decision is made to complete the exchange and the PSO Tract is mined, the disturbance area in this group of surface mines north of Sheridan would increase to approximately 18,385 acres. The proposed Ash Creek Mine would represent an additional 16 percent increase in surface disturbance by mining operations in the Sheridan area.

Excluding the permanently reclaimed Hidden Water Pits and Big Horn Coal Mine areas, and assuming 10 years from initial disturbance to utilization of a parcel of reclaimed land by domestic livestock, roughly 1,500 acres would be unavailable for such use at any given time during active mining. This includes facilities areas at active mines that represent life-of-mine disturbances. However, following reclamation, the replaced topsoil should support a stable and productive native vegetation community adequate in quantity and quality to support planned post-mining land uses (i.e., rangeland and wildlife habitat). Areas within active mines are progressively disturbed. Likewise, these areas would be progressively reclaimed in time by planting appropriate vegetation species to restore soil productivity and prevent soil erosion.

Additional, although less extensive, soil disturbance would be associated with the on-going CBM development predominantly east and south of the mines.

4.8.4 Air Quality

The EPA CALPUFF dispersion model was used with meteorological data generated by the MM5 (mesoscale model) and CALMET models to perform air pollutant dispersion modeling to quantify potential PM_{10} and SO_2 impacts related to proposed oil and gas development, including CBM development, in the PRB in northeastern Wyoming and southeastern Montana. The modeling was conducted by Argonne National Laboratory at the request of the Wyoming and Montana BLM to analyze potential air quality impacts from the oil and gas development alternatives being considered in the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a) and the Montana *Statewide Oil and Gas Final EIS and Proposed Amendment of the Powder River and Billings RMPs* (BLM 2003b). These documents will be referred to as the "Wyoming PRB Oil and Gas Project EIS" and the "Montana Statewide EIS," respectively, in the following discussion. The Wyoming Project Area for this air quality analysis includes Campbell, Sheridan, Johnson, and northern Converse Counties. The Montana Project Area for this air quality analysis includes all of Carter, Powder River, Big Horn, Yellowstone, Carbon, Stillwater, Sweetgrass, Wheatland, Golden Valley, Musselshell, and Treasure Counties and portions of Rosebud and Custer Counties. The PSO Tract Analysis Area is located

in northern Sheridan County, Wyoming.

Surface coal mining operations in Montana and Wyoming were included in the air quality impact assessment as non-project emission sources (other reasonably foreseeable emission sources).

Potential emissions from coal mining activities at each mine within the modeling domain were estimated for 2006, the projected peak emission year for CBM development. The coal mining emissions estimates were based on projected 2006 annual coal production estimates and mining locations provided by the Wyoming and Montana BLM and the reported emission rates per unit of coal production at each mine provided by the WDEQ/AQD and MDEQ/AWM.

Construction emissions related to the proposed oil and gas development would occur during potential road and well pad construction, well drilling, and well completion testing.

This analysis was prepared solely under the requirements of NEPA to assess and disclose reasonably foreseeable impacts to the public and BLM and USFS decision makers. The air quality impact assessment was based on the best available engineering data and assumptions, meteorology data, and dispersion modeling procedures, as well as professional and scientific judgment. However, where specific data or procedures were not available, reasonable assumptions were incorporated. Potential direct project, indirect, and cumulative air quality impacts were analyzed to predict maximum potential near-field ambient air pollutant concentrations and potential HAP impacts, as well as to determine maximum far-field ambient air pollutant concentrations, visibility, and atmospheric deposition (acid rain) impacts. The methodologies used to predict and interpret potential air quality impacts are described in Appendix H.

Air pollution impacts are limited by state, tribal, and federal regulations, standards, and implementation plans established under the CAA and administered by the applicable air quality regulatory agencies (including the WDEQ/AQD, the MDEQ/AWM, or the EPA). The Departments of Environmental Quality for adjacent states have similar jurisdiction over potential air pollutant emission sources in their respective states, which can have a cumulative impact with WDEQ/AQD and MDEQ/AWM approved sources. Air quality regulations require that proposed new, or modified existing air pollutant emission sources undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees, and control devices prior to construction and/or operations of new projects.

The U.S. Congress (through the CAA Section 116) also authorized local, state, and tribal air quality regulatory agencies to establish air pollution control requirements more

(but not less) stringent than federal requirements. As discussed in Chapter 1, if the exchange is completed, P&M would acquire ownership of the federal coal in the PSO Tract. The impacts of mining the coal are considered in this EIS because P&M has indicated that they propose to open a surface coal mine if they acquire the federal coal in the PSO Tract. If P&M proceeds with their proposal to open a mine, they would have to have an approved air quality permit from WDEQ/AQD before the PSO Tract could be mined. Site-specific air quality analysis would be performed and additional emission control measures (including a BACT analysis and determination) may be required to ensure protection of air quality.

The significance criteria for potential air quality impacts include state, tribal, and federally enforced legal requirements to ensure air pollutant concentrations will remain within specific allowable levels. These requirements include the NAAQS and WAAQS, which set maximum limits for several air pollutants, and PSD increments, which limit the incremental increase of certain air pollutants (including NO_2, PM_{10}, and SO_2) above legally defined baseline concentration levels. These legal limits were presented in Table 3-4.

Where legal limits have not been established, BLM uses the best available scientific information to identify thresholds of significant impacts. Thresholds have been identified for HAP exposure, incremental cancer risks, potential atmospheric deposition impacts to sensitive lakes, and a "just noticeable change" in potential visibility impacts.

4.8.4.1 Emission Sources

The air quality impact analysis used market demand predictions in order to estimate levels of coal production in the PRB for modeling purposes. There is enough coal leased to the existing mines in the Wyoming and Montana PRB to supply this market demand during the time of maximum CBM development activity in the PRB, which is the time when the maximum overlapping impacts to air quality would occur. The air quality impact assessment considered production from the neighboring surface coal mines in Montana at levels that would supply anticipated market demand for the years considered in the analysis, but potential production from the proposed Ash Creek Mine was not considered in the analysis because no coal production or other impacts to air quality are anticipated to occur during the time frame that was considered in the air quality impact assessment. As a result, the cumulative impacts predicted by the PRB air quality impact assessment would be the same under the Proposed Action and the alternatives for exchanging or not exchanging the federal coal considered in this EIS.

As discussed in Chapter 3, the major air pollutants emitted from surface coal mining activities are fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, loading and hauling of overburden and coal

and the large areas of disturbed land all produce dust. Stationary or point sources are associated with coal crushing, storage, and handling facilities. In general, particulate matter (PM_{10}) is the major significant pollutant from coal mine point sources. The measures that are being used to control air pollutant emissions from existing approved mining operations, which are also described in Chapter 3, include baghouse dust collection systems, PECs, or atomizers/ foggers, paving mine access roads, applying water and chemical dust suppressants on all haul roads used by trucks and/or scrapers, limiting haul truck speeds, limiting material drop heights for shovels and draglines (bucket to truck bed or backfill), utilizing permanent and temporary revegetation of disturbed areas to minimize wind erosion, and utilizing stilling sheds at coal truck dumps. In addition, some mines in the eastern PRB are participating in the control of fugitive emissions from some nearby unpaved county roads by applying dust suppressants. These measures would be applied if the exchange is completed and if P&M proceeds with the proposal to open a surface coal mine on the PSO Tract.

Air quality impacts related to oil and gas development would occur during construction (due to potential surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including non-CBM well production equipment, booster [field] and pipeline [sales] compression engine exhausts). The amount of air pollutant emissions during construction would be controlled by watering disturbed soils and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. Maximum construction impacts from fugitive dust (24 hour PM_{10}) are estimated to be 55 $\mu g/m^3$, about one third of the applicable WAAQS. Actual air quality impacts depend on the amount, duration, location, and emission characteristics of potential emissions sources, as well as meteorological conditions (wind speed and direction, precipitation, relative humidity, etc.). For additional information about the cumulative impact analyses and assumptions used in the cumulative air quality impact assessment, refer to the Wyoming Oil and Gas Project EIS (BLM 2003a), the Montana Statewide EIS (BLM 2003b) and the Air Quality Impact Assessment Technical Support Document (Argonne 2002)

4.8.4.2 Predicted Air Quality Impacts

The Wyoming PRB Oil and Gas Project EIS evaluates four alternatives in detail. Alternative 1 is the Proposed Action, which assumes that there would be a total of 51,400 CBM wells in the Wyoming PRB by 2012 (39,400 new wells plus 12,000 wells that were in existence when the EIS was prepared). The Proposed Action also assumes drilling of an estimated 3,200 conventional oil and gas wells in the same time period. Alternatives 2A and 2B evaluate alternate emission levels and water

handling scenarios. The BLM's Preferred Alternative is a combination of Alternative 1 and Alternative 2A. Under Alternative 3 (the No Action Alternative), drilling would not occur on federal oil and gas leases but would continue on state and private oil and gas leases. BLM estimates that approximately 15,500 new CBM wells would be developed on state and private lands by 2012 under this alternative, in addition to the 12,000 existing wells. For the purposes of this EIS, the range of potential near-field impacts predicted by the air quality analysis conducted by Argonne National Laboratory for all three Wyoming oil and gas action alternatives are shown in the following tables, as well as the potential impacts predicted under the Wyoming No Action Alternative. Please refer to the Wyoming PRB Oil and Gas Project EIS (BLM 2003a) to see the individual results for each oil and gas action alternative.

Wyoming PRB Oil and Gas EIS Alternatives 1, 2A, and 2B

Under all three oil and gas action alternatives, potential direct project air quality impacts would not violate any local, state, tribal, or federal air quality standards under Alternative 1.

Based on extensive air quality modeling of potential direct project air quality impacts (Argonne 2002), localized short-term increases in CO, NO_x, PM_{10}, and SO_2 concentrations would occur, but all maximum concentrations are expected to be below applicable NAAQS and WAAQS. All maximum near-field direct project NO_2, PM_{10} and SO_2 concentrations are expected to be below applicable PSD Class II increments (Table 4-10), and all maximum far-field direct project concentrations are expected to be below applicable PSD Class I increments (Appendix H).

Although potential direct project impacts to even the most sensitive far-field lakes would not be significant, a "just noticeable change" in visibility was predicted to occur at from nine to 11 mandatory federal Class I areas, ranging up to five days at the Washakie Wilderness Area. The maximum potential direct project visibility impacts were predicted to occur on from 14 to 20 days per year on the Crow Indian Reservation. A detailed description of the air quality impact analysis is presented in Appendix H.

Wyoming PRB Oil and Gas Alternative 3

Potential direct project air quality impacts would not violate any local, state, tribal, or federal air quality standards under Alternative 3 of the Wyoming PRB Oil and Gas Project EIS, the No Action Alternative.

Based on extensive air quality modeling of potential direct project air quality impacts (Argonne 2002), localized, short-term increases in CO, NO_x, PM_{10}, and SO_2 concentrations would occur, but all maximum concentrations are expected to be below applicable NAAQS and WAAQS. All maximum near-field direct project NO_2, PM_{10} and SO_2 concentrations are expected to be below applicable PSD

Table 4-10. Range of Predicted Maximum Potential Near-Field Impacts under Alternatives 1, 2A, and 2B of the Wyoming PRB Oil and Gas Project EIS (with Montana Alternative E).

Pollutant	Averaging Time	Project (µg/m³)	Non-Project (µg/m³)[1]	Cumulative (µg/m³)	PSD Class II (µg/m³)	Background (µg/m³)	Total (µg/m³)[2]	WAAQS (µg/m³)	NAAQS (µg/m³)
NO_2	Annual	6 to 8	3	9 to 10	25	17	26 to 28	100	100
SO_2	Annual	1	1	1	20	3	4	60	80
	24-hour	2	2	3	91	8	11	260	365
	3-hour	3	5	5	512	8	13	1,300	1,300
PM_{10}	Annual	3	1	4	17	17	21	50	50
	24-hour	15 to 20	9	25 to 31	30	42	67 to 73	150	150
$PM_{2.5}$	Annual	1 to 2	1	2		8	10	15	15
	24-hour	11 to 16	9	12 to 24		19	38 to 43	65	65
CO	8-hour	77 to 156	124	132 to 156		1,500	1,624 to 1,656	10,000	10,000
	1-hour	157 to 223	142	170 to 224		3,500	3,670 to 3,724	40,000	40,000

[1] Non-Project sources include CBM sources in Montana and surface coal mining operations in Wyoming and Montana.

[2] The contributions from each source represent maxima and do not necessarily occur at the same location. Therefore the total concentrations will not always equal the sum of the monitored background, Project, and Non-Project concentrations.

Class II increments (Table 4-11), and all maximum far-field direct project concentrations are expected to be below applicable PSD Class I increments Appendix H.

Although potential direct project impacts to even the most sensitive far-field lakes would not be significant, a "just noticeable change" in visibility was predicted to occur one day per year at the mandatory federal Class I Bridger, Fitzpatrick, and Washakie Wilderness Areas. The maximum potential direct project visibility impacts were predicted to occur on 10 days per year on the Crow Indian Reservation. A detailed description of the air quality impact analysis is presented in Appendix H.

4.8.4.3 Cumulative Impacts

The EPA CALMET/CALPUFF dispersion model system was also used to predict maximum far-field potential air quality impacts at downwind mandatory federal PSD Class I areas, and other sensitive receptors, to: 1) determine if the WAAQS, NAAQS, or PSD Class I increments might be exceeded; 2) calculate potential nitrate and sulfate atmospheric deposition (and their related impacts) in sensitive lakes; and 3) predict potential impacts to visibility (regional haze). Argonne National Laboratory also conducted this analysis at the request of the Wyoming and Montana BLM.

Meteorological information was assembled to characterize atmospheric transport and dispersion from several data sources, including: 1) 4-km gridded wind field values derived from the MM5 (mesoscale model) with continuous four-dimensional data assimilation; and 2) hourly surface observations (wind speed, wind direction, temperature, cloud cover, ceiling height, surface pressure, relative humidity, and precipitation).

Wyoming PRB Oil and Gas Project EIS and Montana Statewide Oil and Gas EIS potential air pollutant project sources were combined with non-project sources to determine the total potential cumulative air quality impacts. Coal mining operations in Wyoming and Montana were included as non-project sources.

Potential CO and NO_x emissions were analyzed to predict potential maximum near-field PSD Class II impacts, as well as potential far-field impacts at 29 mandatory federal PSD Class I and other sensitive areas located in Wyoming, Montana, North and South Dakota, and Nebraska (Argonne 2002).

Total concentrations are expected to be in compliance with applicable WAAQS and NAAQS (Appendix H). Table 4-12 presents the maximum predicted air pollutant concentrations at specified PSD Class I areas.

Under the Alternatives considered in the Wyoming PRB Oil and Gas Project EIS, potential cumulative annual NO_2 concentrations and potential cumulative 24-hour PM_{10} concentrations were predicted to be above the PSD Class I increment within the Northern Cheyenne

Table 4-11. Predicted Maximum Potential Near-Field Impacts under Alternative 3 of the Wyoming PRB Oil and Gas Project EIS (with Montana Alternative E).

Pollutant	Average Time	Project (Pg/m³)	Non-Project (Pg/m³)[1]	Cumulative (Pg/m³)	PSD Class II (Pg/m³)	Background (Pg/m³)	Total (Pg/m³)[2]	WAAQS (Pg/m³)	NAAQS (Pg/m³)
NO_2	Annual	3	3	6	25	17	23	100	100
SO_2	Annual	<1	<1	<1	20	3	3	60	80
	24-hour	1	2	2	91	8	10	260	365
	3-hour	1	5	5	512	8	13	1,300	1,300
PM_{10}	Annual	1	1	2	17	17	19	50	50
	24-hour	7	9	16	30	42	58	150	150
$PM_{2.5}$	Annual	<1	0.7	1		8	9	15	15
	24-hour	6	9	13		19	32	65	65
CO	8-hour	183	124	183		1,500	1,683	10,000	10,000
	1-hour	261	142	261		3,500	3,761	40,000	40,000

1 Non-Project sources include CBM sources in Montana and surface coal mining operations in Wyoming and Montana.

2 The contributions from each source represent maxima and do not necessarily occur at the same location. Therefore the total concentrations will not always equal the sum of the monitored background, Project, and Non-Project concentrations.

Table 4-12. Maximum Predicted PSD Class I Area Cumulative Far-Field Impacts (in Pg/m^3) under Wyoming PRB Oil and Gas Project EIS Alternative 1 and all P&M Land Exchange EIS Alternatives.

Pollutant	Averaging Period	Class I Area	Maximum Modeled Concentration (Cumulative)	PSD Class I Increment
NO_2	Annual	Northern Cheyenne Reservation	4.2	2.5
PM_{10}	24-hour	Northern Cheyenne Reservation	12.8	8
	Annual	Northern Cheyenne Reservation	1.7	4
SO_2	3-hour	Northern Cheyenne Reservation	5.1	25
	24-hour	Absaroka-Beartooth Wilderness	2.4	5
	Annual	Northern Cheyenne Reservation	0.3	2

Source: Argonne 2002

Reservation. Under the Wyoming PRB Oil and Gas Project EIS Preferred Alternative, cumulative 24-hour PM_{10} concentrations were also predicted to be above the PSD Class I increment within the Washakie Wilderness Area. These impacts would be the same under all of the alternatives considered in this EIS. As described in Appendix H, other PSD Class I areas had predicted far-field impacts below applicable increments. All PSD Class II areas had predicted far-field impacts below applicable PSD increments. This NEPA analysis compares potential air quality impacts from the proposed development to applicable ambient air quality standards and PSD increments, but these comparisons to the PSD Class I and II increments do not represent a regulatory PSD Increment Consumption Analysis. Even though most of the development activities would occur within areas designated PSD Class II, the potential impacts on regional Class I areas are to be evaluated. For a new source review air quality permit application for a major source, the applicable air quality regulatory agencies may require a regulatory PSD increment analysis. More stringent emission controls beyond BACT may be stipulated in the air quality permits if impacts are predicted to be greater than the PSD Class I or Class II increments.

Several lakes within four USFS designated wilderness areas were identified as being sensitive to atmospheric deposition and for which the most recent and complete data have been collected. The USFS has also identified the following LAC regarding potential changes in lake

chemistry: no more than a 10 percent change in ANC for those water bodies where the existing ANC is at or above 25 Peq/L; and no more than a 1.0 Peq/L change for those extremely sensitive water bodies where the existing ANC is below 25 Peq/L.

Based on a Rocky Mountain Region USFS screening method (USFS 2000), Table 4–13 demonstrates that potential impacts to most sensitive lakes would be below applicable significance thresholds. However, under the Wyoming PRB Oil and Gas Project EIS action alternatives, potential non-project ANC impacts were predicted to exceed the 1.0 µeq/L impact threshold at the very sensitive Upper Frozen Lake within the PSD Class I Bridger Wilderness Area. In addition, under Wyoming PRB Oil and Gas Project EIS Alternative 1, cumulative ANC impacts were predicted to exceed the 10 percent impact threshold at Florence Lake within the PSD Class II Cloud Peak Wilderness Area. Potential impacts at all other sensitive lakes (and under all Wyoming PRB Oil and Gas Project EIS action alternatives) were below the ANC threshold levels. No sensitive lakes were identified by either the NPS or USFWS.

Since the development of the project and non-project air pollutant emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to affect the mandatory federal PSD Class I areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 dv) in visibility when compared to background conditions.

A 1.0 dv change is considered a small but noticeable change in haziness as described in the Preamble to the EPA Regional Haze Regulations (Federal Register, Vol. 64 No. 126, dated July 1, 1999). A 1.0 dv change is defined as about a 10 percent change in the extinction coefficient (corresponding to a two to five percent change in contrast, for a black target against a uniform sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes within mandatory federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, such as due to preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change greater than 1.0 dv might be required to be a "just noticeable change."

This NEPA analysis is not designed to predict specific visibility impacts for specific views in specific

Table 4-13. Predicted Total Cumulative Change in Acid Neutralizing Capacity at Sensitive Area Lakes (percent change).

Wilderness Area	Lake	Background ANC (Peq/L)	Area (hectares)	Change (percent)	Thresholds (percent)
Bridger	Black Joe	69	890	2.2 to 2.1	10
	Deep	61	205	2.5 to 3.0	10
	Hobbs	68	293	1.3 to1.5	10
	Upper Frozen	5.8[a]	65	1.6 to 1.9[b]	1[b]
Fitzpatrick	Ross	61.4	4,455	1.8 to 2.1	10
Absaroka-Beartooth	Stepping Stone	27	26	2.3 to 2.5	10
	Twin Island	36	45	1.6 to 1.8	10
Cloud Peak	Emerald	55.3	293	5.0 to 6.0	10
	Florence	32.7	417	8.9 to 10.7	10
Popo Agie	Lower Saddlebag	55.5	155	3.2 to 3.8	10

Notes:
[a] The background concentration is based on only six samples taken on four days between 1997 and 2001.
[b] Since the background ANC value is less than 25 Peq/L, the potential ANC change is expressed in Peq/L, and the applicable threshold is 1.0 Peq/L.
Source: Argonne 2002

mandatory federal Class I areas based on specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on reasonable emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a pre-construction air quality PSD permit application, the applicable air quality regulatory agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of dv change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as the modeling analyses assumptions) should all be considered when assessing the significance of predicted impacts.

The USFS, NPS, and USFWS have published their Final FLAG Phase I Report (Federal Register, Vol. 66 No. 2, dated January 3, 2001), providing "a consistent and predictable process for assessing the impacts of new and existing sources on AQRVs" including visibility. For example, the FLAG report states "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "If the visibility impairment from the Proposed Action, in combination with cumulative new source growth, is less than a change in extinction of 10 percent [1.0 dv] for all time periods, the FLMs will not likely object to the Proposed Action." Although the FLAG procedures were primarily designed to provide analysis guidance to PSD permit applicants, the following analysis

uses the Final FLAG Phase I Report procedures for this NEPA analysis.

Based on multiple iterations of the non-steady state CALPUFF dispersion modeling system, including the CALMET meteorological model, for four different development alternatives, potential cumulative visibility impacts estimated by the seasonal FLAG screening method exceeded the impact thresholds (including the use of FLAG and WDEQ-AQD provided background extinction values) at all 29 sensitive areas analyzed. Therefore, potential maximum visibility impacts were estimated using the daily FLAG refined method (based on hourly optical extinction and relative humidity values measured at two IMPROVE monitoring locations) for each Class I and Class II sensitive area. Although the potential modeled impacts for each sensitive area were based on 1996 MM5 regional meteorology, these values were compared to hourly optical extinction and relative humidity data collected at two locations in the project area between 1989 and 1999.

For example, since the 1.0 dv threshold was predicted to be reached within the mandatory federal PSD Class I Washakie Wilderness Area based on the seasonal FLAG screening methodology, the maximum modeled cumulative impacts at that area were also compared to representative hourly optical and relative humidity values measured at Bridger Wilderness Area between 1989 and 1999 using the daily FLAG refined method (Table 4–14). The range of impacts was then summarized as the annual average number of days over the 11-year period predicted to equal or exceed a 1.0 dv “just noticeable change” (Table 4–15).

The prediction of potential visibility impacts based on the daily FLAG refined methodology using measured optical extinction conditions is not intended to be an air quality regulatory analysis. Such analysis would be conducted by the applicable air quality regulatory agencies before actual development could occur. The applicable air quality regulatory agencies (including the state, tribe or EPA) would review specific air pollutant emissions pre-construction permit applications that examine source-specific air quality impacts. As part of these permits (depending on source size), the air quality regulatory agencies could require additional air quality impacts analyses or mitigation measures. Thus, before development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality. For further mitigation information see Section 4.6 and Appendix H.

Coal mines develop predictive models (i.e., FDM ISCLT3) to assess the potential air quality impacts of their mining operations. Based on these predictive models conducted for PRB mines, mining operations do not have significant off-site particulate pollution impacts, even when production and pollution from neighboring mines are considered.

Table 4-14. Predicted Visibility Impacts in the Mandatory Federal PSD Class I Washakie Wilderness Area from Direct Wyoming PRB Oil and Gas Project EIS Alternative Sources - Daily FLAG Refined Method (Average Number of Days per Year Predicted to Equal or Exceed a 1.0 dv "Just Noticeable Change").

Alternative	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	4	2	7	6	4	7	4	6	7	2	6
2A	2	2	6	5	4	6	4	5	5	1	4
2B	1	2	6	5	3	6	4	4	5	1	3
3	1	0	4	3	1	1	2	2	2	0	0

Note: Potential cumulative visibility impacts were predicted using daily background optical and relative humidity conditions for each of the years listed above.
Source: Argonne 2002

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 (<1.0 Pg/m^3 PM_{10} annual average) within six miles of active mining. In the vicinity of the PSO Tract, there are two active surface coal mining operations, the Decker Coal Mine and the Spring Creek Coal Mine. Both are located in Big Horn County, Montana and both are located six or more miles from the PSO Tract.

In cases where mines are in close proximity (within two miles), WDEQ follows a modeling protocol which accounts for all mine-generated particulate air pollutants from all nearby mines to determine impacts to ambient air quality. Known as the Mine A/Mine B modeling procedure, this model evaluates the total impacts of a given mining operation, including those impacts from and on neighboring mines. The PSO Tract is not within two miles of an existing mine.

Gaseous reddish-brown clouds, some containing concentrations of NO_x, have been produced by overburden blasting at surface coal mines in the PRB. In 1995, 1998, and 1999, OSM received citizen complaints concerning NO_x gases generated from blasting operations drifting off mine permit areas (OSM 2000). No citizen complaints were received by OSM or WDEQ during the 2001 evaluation year, which ended on September 30, 2001 (OSM 2002a) or the 2002 evaluation year, which ended on September 30, 2002 (OSM 2002b). These reddish-brown clouds generally do not overlap due to the distances between mines and the variation in blasting schedules. However, areas adjacent to the permit areas for this group of mines could be affected on different occasions by blasting clouds from several different mines, depending on the weather conditions.

The nature of these blasting clouds and human health consequences resulting from short-term exposures to NO_x are discussed in Section

Table 4-15. Predicted Visibility Impacts in Class I Areas - Daily FLAG Refined Method (Average Number of Days per Year Predicted to Equal or Exceed a 1.0 dv "Just Noticeable Change") (Results shown are the predicted impacts under Wyoming PRB Oil and Gas Project Alternatives 1, 2A, 2B, and 3. Impacts related to coal mining under all South PRB Coal EIS Alternatives are included under "Non-Project Sources").

Class I Area	Alt 1	Alt 2A	Alt 2B	Alt 3	Non-Project Sources	Cum Sources
Badlands Wilderness Area[1]	3	3	1	0	13 to 17	18 to 28
Bridger Wilderness Area	4	4	3	1	7 to 9	8 to 12
Fitzpatrick Wilderness Area	4	3	3	1	6 to 9	8 to 12
Gates of the Mtns Wilderness Area	0	0	0	0	3 to 4	3 to 4
Grand Teton National Park	1	1	0	0	3 to 5	4 to 8
North Absaroka Wilderness Area	4	3	2	0	9 to 13	11 to 15
Red Rock Lakes Wilderness Area	0	0	0	0	0 to 1	0 to 3
Scapegoat Wilderness Area	0	0	0	0	2 to 2	2 to 3
Teton Wilderness Area	3	3	2	0	6 to 9	7 to 11
Theodore Roosevelt NMP[2] (North Unit)	0	0	0	0	1 to 1	1 to 3
Theodore Roosevelt NMP[2] (South Unit)	1	0	0	0	1 to 3	2 to 7
U.L. Bend Wilderness Area	1	1	1	0	4 to 5	5 to 8
Washakie Wilderness Area	5	4	4	1	10 to 14	12 to 18
Wind Cave National Park	4	3	2	0	17 to 21	22 to 28
Yellowstone National Park	3	2	1	0	8 to 11	9 to 13
Northern Cheyenne Reservation[3]	17	16	14	7	27 to 82	33 to 92

Notes:

[1] The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory federal PSD Class I area. The remainder of Badlands National Park is a PSD Class II area.

[2] NMP - National Memorial Park.

[3] Although the Northern Cheyenne Reservation is a tribal designated PSD Class I Area, it is not a mandatory federal PSD Class I area subject to EPA's Regional Haze Regulations.

Non-Project Sources - The impact of all air pollutant emission sources not included in Wyoming PRB Oil and Gas Project EIS Alt 1, Alt 2A, Alt 2B or Alt 3, including existing surface coal mines in Wyoming and Montana and the Montana Statewide EIS sources. The range of potential annual average days above a 1.0 dv "just noticeable change" in visibility corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).

Cum Sources - The impact of all cumulative air pollutant emission sources combined, including Wyoming PRB Oil and Gas Project EIS Alt 1, Alt 2A, Alt 2B, Alt 3, and Non-Project Sources (which include the South PRB Coal EIS Proposed Action and Alternatives and Montana Statewide EIS sources). The range of potential annual average days above a 1.0 dv "just noticeable change" in visibility corresponds to: including Non-Project, Wyoming Alternative 3 and Montana Alternative A sources (low); up to including Non-Project, Wyoming Alternative 1 and Montana Alternative B/C/E sources (high).

Source: Argonne 2002

4.4.4. There is no short-term ambient air standard for NO_2 in Wyoming.

In response to the public concern about these clouds and the potential consequences to human health, WDEQ and the mines have developed required and voluntary measures to protect the public from exposure to the clouds. These measures are described in Chapter 3 of this document. The mines in the eastern PRB have also been cooperating in a research and development effort aimed at reducing blasting clouds (Casper Star Tribune 2002). This research has led to changes in blasting agents and the size of blasting shots that have reduced NO_x emissions during blasting. As indicated above, no citizen complaints were received by OSM or WDEQ/LQD during the 2001 and 2002 evaluation years.

Another air quality concern is the venting of methane that occurs when coal is mined. As discussed in Section 3.4.3.1 of this document, methane is generated from coal beds. When coal is mined, by surface or underground methods, the methane that is present in the coal is vented to the atmosphere. Methane is a greenhouse gas that contributes to global warming. According to the EIA/DOE, U.S. anthropogenic methane emissions totaled 28.0 million metric tons in 2001 (U.S. Department of Energy 2002). U.S. 2001 methane emissions from coal mining were estimated at 2.78 million metric tons (10 percent of the U.S. total anthropogenic methane emissions in 2001). According to Table 14 of that report, surface coal mining was estimated to be responsible for about 0.53 million metric tons of methane emissions in 2001. This represents about 1.89 percent of the estimated U.S. anthropogenic methane emissions in 2001, and about 19.06 percent of the estimated methane emissions attributed to coal mining of all types. Based on the 2001 coal production figures, it is estimated that Wyoming and Montana PRB surface coal mines were responsible for approximately 0.98 percent of the estimated U.S. anthropogenic methane emissions in 2001.

In many areas, including the PRB, CBM is being recovered from coal and sold. On a large scale, recovery of CBM from the coal prior to mining by both surface and underground methods could potentially gradually reduce U.S. emissions of CBM to the atmosphere. In the PRB, CBM is being produced from the coal areas adjacent to and generally downdip of the mines. CBM is currently being produced from the same coal seams that would be mined if the exchange is completed and P&M proceeds with its proposal to open a new mine. As discussed in Section 4.4.2 of this EIS, BLM estimates that a large portion of the CBM reserves could be recovered prior to initiation of mining activity on the PSO Tract if the exchange is completed. CBM reserves that are not recovered prior to mining would be vented to the atmosphere.

4.8.5 Water Resources

4.8.5.1 Surface Water

Streamflow may be reduced during surface coal mining because SMCRA and Wyoming State regulations require capture and treatment of all runoff from disturbed areas in sedimentation ponds before it is allowed to flow off the mine permit areas. Also, large surface coal mine pits, together with ponds and diversions built to keep water out of the pits, can intercept the runoff from significant drainage areas. Changes in drainage patterns and surface disturbance would decrease flows in most of the ephemeral and intermittent drainages exiting the mine sites. The proposed Ash Creek Mine would be located approximately six miles southwest of the closest active surface coal mining operation, which is the Decker Coal Mine in Big Horn County, Montana. Due to the distance between these two operations, there would not be many overlapping surface water impacts.

Development of CBM resources in the general area of the mines could potentially increase surface flow in some drainages.

The Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a) and the Montana *Statewide Oil and Gas Final EIS and Proposed Amendment of the Powder River and Billings RMPs* (BLM 2003b) evaluate the surface water impacts that would potentially occur as a result of proposed CBM development in the Upper Tongue River sub-watershed, which is where the PSO Tract is located.

Modeling done for the Wyoming and Montana EISs indicates that the suitability of the Tongue River for irrigation may be compromised by the surface discharge of CBM-produced water during maximum CBM development in both states. Surface discharge to the Tongue River in both Wyoming and Montana currently is controlled by the two State DEQs. These agencies have agreed to an interim “no new discharge” policy that would not authorize untreated surface discharge of CBM waters to the Tongue River unless the water quality was at or near the existing level in the Tongue River. Southeastern Montana irrigators, CBM producers, and the MDEQ have been discussing water releases and water quality issues in the Tongue River drainage basin. A compromise was reached on March 28, 2003 and the State of Montana adopted numeric limits in water quality standards for CBM discharge water. Those limits are related to the irrigation season and the Tongue River’s seasonal discharge rate (Billings Gazette March 2003). In addition, the Wyoming EIS’s (BLM 2003a) Preferred Alternative (Alternative 2A) emphasizes the use of infiltration impoundments to dispose of CBM produced water.

The amount of CBM produced water that ultimately reaches the major channels would be reduced by evaporation, infiltration into the ground, and surface landowners, who sometimes divert the produced

water into reservoirs for livestock use. These CBM water discharges would be constant, as opposed to naturally occurring flows which fluctuate widely on a seasonal and annual basis.

The CBM discharges could result in erosion and degradation of small drainages, which could affect water quality and channel hydraulic characteristics. From a surface water standpoint, any increased flows due to CBM discharges occurring downstream of surface mining operations would tend to be offset by the reduced flows due to surface coal mining.

The USGS has predicted that after reclamation, cumulative disturbance related to surface coal mining in the eastern PRB will result in increased runoff in major streams (Martin et al. 1988). This is based on the assumption that unit runoff rates would be increased after reclamation due to soil compaction. Other studies also indicate that soil infiltration rates are lower on reclaimed lands than on pre-mining lands due to changes in drainage patterns and surface disturbance. However, the reduction in slope after reclamation would provide enhanced opportunity for infiltration of precipitation which would tend to offset this temporary decrease in soil infiltration rates.

Drainage from all the surface mines in the general vicinity enters the Tongue River and Tongue River Reservoir. The drainage area of the Tongue River at the State line (USGS Station 06306300) is approximately 1,477 square miles. The entire disturbance area of the proposed Ash Creek Mine (2,595 acres) represents about 6.3 percent of the Youngs Creek watershed at its confluence with the Tongue River and less than 0.3 percent of the Tongue River watershed at the State line. This 2,595 acres would not all be disturbed at any one time. The entire area of disturbance from all surface mines within the Tongue River watershed upstream of the Tongue River Reservoir would impact approximately 0.5 percent of the drainage basin to that point.

If the PSO Tract is mined as proposed, sediment concentrations should not increase substantially in the disturbed streams because, as discussed in Section 4.4.5.1, state and federal regulations require that all surface runoff from mined lands pass through sedimentation ponds. Although reclaimed soils may be more erosive for a few years after reclamation, the larger sediment production would not be delivered to streams due to sediment deposition as a result of flatter slopes on restored lands and sediment trapping by mandated sedimentation ponds.

4.8.5.2 Groundwater

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts

of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If revisions to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If a decision is made to complete the exchange and P&M decides to construct a new surface coal mine, a mining and reclamation permit for the proposed Ash Creek Mine must be approved before the tract can be mined.

A source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ and MDEQ and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas. Annual hydrology reports are submitted to the respective regulatory agency by Big Horn Coal Company, Ash Creek Mining Company, Spring Creek Coal Company, and Decker Coal Company.

The major groundwater issues related to surface coal mining are:

- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;
- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with backfill material;
- the effects to aquifers used for water supply that are sub-mine disturbance levels;
- changes in water quality as a result of mining; and
- potential overlapping groundwater impacts in the coal due to proximity of coal mining and CBM development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

Assessment of cumulative mining-related groundwater drawdown impacts in this EIS is based on predictions made by the Ash Creek Mining Company that were included in the PSO No. 1 Mine Permit Application No. 407. This information was then extrapolated to consider mining of the PSO Tract. Figure 4-3 depicts the predicted drawdown in the Dietz 1/Dietz 3 coal seam aquifer over the life of the proposed Ash Creek Mine attributed to pit dewatering. The other active mines that are in proximity share an interconnected groundwater system; therefore, the areal extent and

magnitude of drawdown resulting from these other operations were investigated to evaluate the cumulative drawdown impacts by all three operations.

As addressed in Sections 3.4.6.1 and 4.4.5.1, mining-related drawdown in the Dietz 1 and 3 coal seam aquifers would be prevented or substantially restricted by the northeast-trending fault planes that bound the northwest and southeast sides of the PSO Tract. Truncation of the coal seams by the structural faults serves as a barrier to groundwater flow; therefore, potentiometric declines during active mining would be strongly controlled by these faults. Furthermore, the seams that would be mined are not continuous to the southwest, so drawdowns can extend only to the northeast at any appreciable distance from the mine. Drawdown attributed to any other activity must therefore be present within the same fault block and be located northeast of the PSO Tract in order for a cumulative effect to occur.

Due to the discontinuous nature of the coal seams that would be mined in the PSO Tract in the direction of the Big Horn Coal Mine, it is very unlikely that any residual drawdowns created by that mining operation would be additive with drawdowns that would result from mining the PSO Tract. The geographic extent and amount of drawdown associated with mining in the Decker/Spring Creek area is complicated by numerous northeast-trending normal faults that cross the area, similar to those bounding the PSO Tract, which are discussed above. The aquifers that are affected by the Spring Creek Mine and that would be affected by the proposed Ash Creek Mine are separated by faults that would restrict or prevent an overlap of the groundwater drawdowns cause by these two operations. The Decker Mine and the PSO Tract do occur within the same fault block and therefore share the same coal seam groundwater flow system. No flow models have been developed for the Decker and Spring Creek Mines for use in predicting drawdown impacts. Rather, predictions for future drawdowns are based on current trend data and mine plans (MDEQ 1999). Based upon the Cumulative Hydrologic Impact Analysis for the Decker area that was prepared by the MDEQ in 1999, current drawdowns resulting from the Decker Mine do not extent into the PSO Tract area and they are not predicted to during the anticipated mine life.

In Wyoming, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The effects of replacing the coal aquifer and overburden with a backfill aquifer is also a major groundwater concern related to surface coal mining. The following discussion of recharge, movement, and discharge of water in the backfill aquifer for the eastern PRB is excerpted from Martin et al. 1988;

> Post-mining recharge, movement, and discharge of

groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from pre-mining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

In the eastern PRB, water monitoring data from 1990 to 2001 verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001). Data from backfill monitoring wells at the Big Horn and Decker Mines demonstrate that recharge to the backfill occurs readily in the northern PRB as well.

The cumulative size of the backfilled areas in the Tongue River drainage would be increased by approximately 1,720 acres by mining the proposed Ash Creek Mine. Pre-mining recharge areas (i.e., clinker or scoria outcrops, alluvial valley subcrops) would continue to be the recharge sources for the post-mining backfill aquifer.

The area in which the alluvial aquifers experience a five-ft drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and are typically unconfined. If P&M develops the Ash Creek Mine as proposed, drawdowns in the alluvial aquifers would be expected to be very local.

If the exchange is completed and P&M elects to construct a new mine, the WDEQ would require more detailed groundwater modeling to predict the extent of drawdown in the coal aquifers caused by mining the PSO Tract. WDEQ/LQD would then use the drawdown predictions to conduct a cumulative hydrologic impact analysis for this portion of the PRB. P&M would be required to install monitoring wells which would be used to confirm or refute drawdowns predicted by modeling. This modeling would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

Potential mining-related water-level decline in the sub-Dietz 3 coal is another groundwater issue. Mine water supply wells used by the Decker Coal Mine are located at least five miles away from the PSO Tract. Due to the distance involved, the possibility of additive drawdowns within a sub-Dietz 3 coal seam aquifer are unlikely. In addition, the zone of completion for the Decker Mine's production wells may not be the same as that of the proposed Ash Creek Mine's production well(s).

Another issue of concern with groundwater is the effect of mining on water quality. Specifically, what

effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the backfill aquifer following mining?

In a regional study of the cumulative impacts of coal mining in the eastern PRB, the median concentrations of dissolved solids and sulfates were found to be larger in water from backfill aquifers than in water from either the Wasatch overburden or the coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly when the overburden materials were situated above the saturated zone in the pre-mining environment. Using data compiled from ten surface coal mines in the eastern PRB, Martin et al. (1988) also concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. The same conclusions were reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. Clark (1995) conducted a study to determine if the decreases predicted by the laboratory studies occur onsite. In the area of the West Decker Mine, his study found that dissolved solids concentrations increased when water from an upgradient coal aquifer flowed into a spoils aquifer, and apparently decreased along an inferred path from a spoils aquifer to a downgradient coal aquifer. In general, the mine backfill groundwater TDS can be expected to range from 3,000 - 6,000 mg/L, similar to the pre-mining aquifer, and meet Wyoming Class III standards for use as stock water. In the West Decker Mine study, the TDS concentration decreased from 4,100 mg/L to 2,100 mg/L along the inferred flow path from the spoils aquifer to a downgradient coal aquifer.

One pore volume of water is the volume of water which would be required to saturate the backfill following reclamation. The time required for one pore volume of water to pass through the backfill aquifer is greater than the time required for the post-mining groundwater system to re-establish equilibrium. According to Martin et al. (1988), estimates of the time required to re-establish equilibrium range from tens to hundreds of years.

According to monitoring data, water quality variation in the backfill at the Decker and Spring Creek Coal Mines in the northern PRB is attributable to changes in recharge or discharge associated with mine activity and may vary with the amount and source of recharge. However, as stated within the MDEQ's Cumulative Hydrologic Impact Analysis for the Decker area (1999), TDS concentrations in backfill water would be lowered as upgradient groundwater recharges and flushes the backfill aquifer. The length of time needed for this to occur is unknown; however, the decline in water quality from the backfill aquifers is expected to be a long-term impact but is not anticipated to be permanent. As

indicated previously, the cumulative size of the backfilled areas in the Tongue River drainage would be increased by approximately 1,720 acres by mining the proposed Ash Creek Mine. No overlapping impacts to water quality in the backfill would be expected due to the distances between the proposed Ash Creek Mine and the other mines in this area (Decker, Spring Creek, and Big Horn).

The potential for overlapping groundwater impacts from coal and CBM development is also a major groundwater issue in the PRB.

As previously discussed, CBM drilling has occurred on and adjacent to the PSO Tract in Wyoming and CBM exploration and limited production was initiated in Montana, in the Decker area, in 1998.

The *Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project* (BLM 2003a) includes a groundwater drawdown modeling analysis that considered existing and proposed CBM production in the area of the proposed Ash Creek Mine. It does not predict large CBM-related drawdowns in the area of the proposed Ash Creek Mine, which is generally located at the western edge of proposed CBM development in Wyoming. Any cumulative groundwater impacts would be limited in the northwest, southwest, and southeast directions from the proposed Ash Creek Mine area because of the coal seam aquifers' lack of continuity in those directions.

In Montana, MDEQ's Cumulative Hydrologic Impact Analysis (1999) for the Decker Mine was written prior to CBM dewatering effects and therefore does not account for potential cumulative drawdown effects. Potentially, drawdown impacts associated with CBM production could exceed the extent and amount of drawdown associated with mining in the Decker area. For example, after a production period of four months (December 1998 through March 1999), 11 CBM wells pumping at an average rate of 17 gpm each created sharp increases in drawdown at Decker Coal Company's monitoring wells located a mile or more south of the West Decker Mine. At least 300 CBM wells are proposed south of the Decker Mine in Montana (MDEQ 1999). This level of CBM development would potentially cause substantial groundwater level declines within all of the producing coal seam aquifers in this general area.

A large number of CBM wells have been drilled near P&M's reclaimed Ash Creek Mine property, and hydrographs recorded by coal seam monitoring wells in the area reveal significant declines in groundwater levels since the last quarter of 2001. The Ash Creek Mine's latest Annual Mining and Reclamation Report to the WDEQ/LQD presents records that show declines in all coal monitoring wells in the 2002 annual report period ranging from nine to almost 90 feet, most of which can be attributed to dewatering activities by nearby CBM operations (P&M 2002). Although an extended period of lower than normal precipitation has

affected water levels in alluvium, significant declines in water levels in the two monitored coal beds, the Dietz 1 and Dietz 3, cannot be attributed to drought conditions (P&M 2002). Monitoring well WR-39 (Figure 3-9), which is completed in the combined Dietz 1/Dietz 3 seam, has experienced an overall water level decline of more than 125 ft since the second quarter of 2001 (P&M 2002).

As discussed in Section 4.4.5.2, two groundwater right holders in Montana have been identified as potentially affected by proposed mining operation on the PSO Tract, based on the assumption that both well completion depths are such that they produce water from the Dietz 1/Dietz 3 coal seam. Additional water supply wells completed in the coal seam aquifers in the general analysis area would be expected to experience drawdown as a result of CBM development.

The increased dewatering or depressuring of the coal seam caused by CBM development and mining together would also increase the time required for water-level recovery to occur after the CBM and mining projects are completed. The groundwater impact analysis prepared for the *Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project* (BLM 2003a), which considered CBM development and coal mining operations, generally indicates that water levels would recover 75 to 80 percent of pre-operation conditions within 14-16 years following the cessation of CBM operations. This analysis also indicated that the rate of recovery would slow dramatically after this initial recovery period, recovering to within 95 percent of pre-operations conditions over the next 100 years or so.

4.8.6 Alluvial Valley Floors

No cumulative impacts to AVFs are expected to occur as a result of completing the exchange and subsequent mining of the PSO Tract. Impacts to designated AVFs are generally not permitted if the AVF is determined to be significant to agriculture. AVFs that are not significant to agriculture can be disturbed during mining but they must be restored as part of the reclamation process. Impacts during mining, before the AVF is restored, would be expected to be incremental, not additive.

4.8.7 Wetlands

Wetlands are discrete features that are delineated on the basis of specific soil, vegetation, and hydrologic characteristics. Wetlands within areas of coal mining disturbance are impacted; wetlands outside the area of disturbance are generally not affected unless their drainage areas (hence, water supplies) are changed by mining. Therefore, the impacts to wetlands as a result of surface coal mining are mostly incremental, not additive as are impacts to groundwater and air quality. Increasing the area to be mined would increase the number of wetlands that would be impacted.

COE requires replacement of all impacted jurisdictional wetlands in

accordance with Section 404 of the Clean Water Act. As part of the mining and reclamation plans for each mine, COE approves the plan to restore the wetlands and the number of acres of wetlands to be restored. Replacement of functional wetlands may occur in accordance with agreements with the surface managing agency (on public land) or by the private surface owners. A total of 6.41 acres of federal surface lands are included in the PSO Tract. During mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not function in the same way as the premine wetlands did. As discussed in Section 4.4.7, COE generally uses a programmatic general permit, 99-03, to authorize surface coal mining activities in wetlands and other waters of the U.S. in Wyoming. That permit has restrictions that do not allow the realignment or channelization of perennial streams. If the exchange is completed and P&M proceeds with their proposal to develop a surface coal mine in this area as indicated in Figure 2-2, resulting in the realignment or otherwise modification of Little Youngs and Youngs Creeks, the general permit process would not apply and an individual permit would be required. That process would require that P&M consider other alternatives, including completely avoiding impacts to these creeks and other sensitive aquatic resources with mining operations.

4.8.8 Vegetation

Most of the land that would be disturbed is grassland and sagebrush shrubland which is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the PRB. At the completion of mining, it is anticipated that all disturbed land would be reclaimed for grazing and wildlife habitat, mostly in the form of mixed native grass prairie, sagebrush shrubland and, where appropriate, bottomland grassland. Some of the minor community types, such as those occurring on breaks, would not be restored to pre-mining conditions but may be replaced to a higher level due to use of better quality soils.

Based on annual reports prepared by Spring Creek and Decker Coal Companies and submitted to MDEQ, in any given year, approximately 1,500 acres of land disturbed by mining activities at these two existing surface coal mines would not be reclaimed to the point of planting with permanent seed mixtures. Over the life of these two mines, a total of about 13,629 acres would be disturbed. This disturbed area includes all leases existing including federal, state, and private coal. The proposed Ash Creek Mine would add another 2,595 acres. Almost all of this acreage is native rangeland and would be returned to a native rangeland state through planting of approved revegetation seed mixtures as required. The Big Horn Coal Mine and the Hidden Water Pits were reclaimed to a native rangeland state as well.

Several impacts to vegetation would occur as a result of operations at the existing and proposed mines.

Most of the surface disturbance on the PSO Tract would occur in one vegetation type: mixed shrub grass prairie (78 percent). The Decker and Spring Creek Mines are currently restoring and the proposed Ash Creek Mine would restore the mixed native prairie grass and big sagebrush as required by law. It is estimated that it would take from 20 to 100 years for big sagebrush density to reach pre-mining levels. The big sagebrush component provides important wildlife habitat (particularly for mule deer, pronghorn, and sage grouse). The reduction in acreage of big sagebrush vegetation type would, therefore, reduce the carrying capacity of the reclaimed lands for pronghorn and sage grouse populations until sagebrush density reaches premining levels.

Although some of the less extensive native vegetation types (e.g., graminoid/forb ephemeral drainages) would be restored during reclamation, the treated grazing lands would not. Following reclamation and release of the reclamation bond, however, privately owned surface lands would be returned to private management and the areas with reestablished native vegetation could again be subject to sagebrush management practices.

Community and species diversities would initially be lower on reclaimed lands. The shrub and tree components would take the longest to be restored to pre-mining conditions. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species re-invasion and shrub and tree establishment on reclaimed lands should largely restore the species and community diversity on these lands to pre-mining levels.

Over the long term, the net effect of the cumulative mine reclamation plans may be the restoration, at least in part, of all vegetation types originally found in the area. However, the shrub component may be substantially reduced in areal extent. Shrubs and trees are relatively unproductive for livestock but very important for wildlife. All of the vegetation types found in the cumulative analysis area, as on the PSO Tract, are fairly typical for this region of north-central Wyoming.

Energy development in the PRB could allow the spread of weedy (invasive nonnative) plant species. The reclamation plan for the proposed Ash Creek Mine would include steps to control invasion by these plant species.

Impacts to vegetation related to disturbance from CBM development would be added to the impact of mining. Generally, disturbances related to mining are intense but concentrated in a discrete area, while disturbances related to CBM development are scattered but spread out over a large area.

4.8.9 Wildlife

The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on

wildlife movement created by fences, spoil piles, and pits, and displacement of wildlife from active mining areas. The indirect impacts are longer term and include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush, ponderosa pine, and Rocky Mountain juniper density, would cause a decrease in carrying capacity and diversity on the PSO Tract. These vegetation types would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent.

Cumulative impacts to most wildlife would increase as additional habitat is disturbed by mining and other activities, including CBM development. These impacts would moderate as land is reclaimed. Raptor and grouse breeding areas have been diminishing statewide for at least the last 30 years due, in part, to surface-disturbing activities. Coal mining and gas exploration and development have been identified as potential contributors to the decline in their breeding habitat. Therefore, surface occupancy and disturbance restrictions, as well as seasonal restriction stipulations, have been applied to operations occurring on or near these crucial areas on public lands. These restrictions have helped protect important raptor and grouse habitat on public lands, but the success of yearlong restrictions on activities near areas critical to grouse has been limited because most of the surface in the PRB is privately owned.

Erection of nesting structures and planting of trees on land reclaimed by surface coal mines would gradually replace raptor nesting and perching sites that are affected by development in areas affected by mining. There is little crucial habitat for waterfowl or fish on the mine sites, so mining would not substantially contribute to impacts to those species. Small- and medium-sized animals would move back into the areas once reclamation is completed.

Numerous grazing management projects (fencing, reservoir development, spring development, well construction, vegetative treatments) have also impacted wildlife habitat in the area. The consequences of these developments have proven beneficial to some species and detrimental to others. Fencing has aided in segregation and distribution of livestock grazing, but sheep-tight woven wire fence has restricted pronghorn movement. Water developments are used by wildlife; however, without proper livestock management, many of these areas can become overgrazed. The developed reservoirs provide waterfowl, fish, and amphibian habitat. Vegetation manipulations have included the removal or reduction of native grass-shrublands and replacement with cultivated crops (mainly alfalfa/grass hay), as well as a general reduction of shrubs (mainly

sagebrush) in favor of grass. These changes have increased spring and summer habitat for grazing animals but have also reduced the important shrub component that is critical for winter range, thus reducing overwinter survival for big game and sage grouse. The reduction in sagebrush has been directly blamed for the downward trend in the sage grouse populations.

The regional EISs which covered the northern PRB (BLM 1981 and 1984) predicted that large-scale surface coal mining could potentially result in significant cumulative impacts to big game due to habitat loss; restrictions in seasonal and daily movement caused by railroads, access roads, and mining operations; poaching; urban development; range overuse; possible lack of water sources; increased road kills; and crop depredation. The WGFD has concluded that monitoring has demonstrated a lack of impacts to big game on the existing mine sites which are concentrated in the eastern PRB. No severe mine-caused mortalities have occurred and no long-lasting impacts on big game have been noted on existing mine sites. The WGFD therefore has recommended that big game monitoring be discontinued on all existing mine sites in Wyoming. New mines will be required to conduct big game monitoring if located in crucial winter range or in significant migration corridors. No crucial or critical pronghorn habitat has been identified in the area of the PSO Tract, no crucial big game habitat or migration corridors are recognized by the WGFD for this area, and mining operations in this area are not concentrated.

The PSO Tract is within the Clearmont Pronghorn Herd Unit, which includes about 716,800 acres. The proposed Ash Creek Mine would be the only active surface coal mining operation within this herd unit. If the PSO Tract is mined, the total disturbance of 2,595 acres represents approximately 0.4 percent of the Clearmont Herd Unit area.

The PSO Tract is located within the North Big Horn Mule Deer Herd Unit. The herd unit contains approximately 1.64 million acres. The proposed Ash Creek Mine would be the only active surface coal mining operation within this herd unit. If the PSO Tract is mined, the total disturbance of 2,595 acres represent approximately 0.1 percent of the North Big Horn Mule Deer Herd Unit.

The WGFD big game herd unit maps show the PSO Tract is within the 5.5 million acre Powder River White-tailed Deer Herd Unit. If the PSO Tract is mined, the total disturbance would equate to less than 0.05 percent of the herd unit's area.

The area of active mining in the general vicinity of the PSO Tract contains significant numbers of raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country, stream valleys with trees, and upland areas where trees are established. Raptor mitigation plans must be included in the approved mining and

reclamation plans of each mine. The raptor mitigation plan for each mine is subject to USFWS review and approval before the mining and reclamation plan is approved. Any nests that are impacted by mining operations must be relocated in accordance with these plans, after special use permits are secured from USFWS and WGFD. The creation of artificial raptor nest sites and raptor perches may ultimately enhance raptor populations in the mined area. SMCRA requires surface coal mine operators to ensure that electric powerlines and other transmission facilities are designed and constructed to minimize electrocution hazards to raptors [30 CFR 816.97(e)(1)]. However, 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 Ash Creek Mine, would be minor because most of these birds are transient and most of the ponds are ephemeral. In addition, impoundments and reservoirs that are impacted by mining would be restored. Sedimentation ponds and wetland mitigation sites would provide areas for waterfowl during mining. An 86-acre post-mining impoundment was created within Big Horn Coal Mine's reclaimed lands, providing excellent waterfowl habitat that did not exist prior to mining.

Direct habitat disturbance from already-approved mining, as well as the proposed Ash Creek Mine, should not substantially affect regional sage grouse populations because few vital sage grouse wintering areas or leks have been, or are planned to be, disturbed. However, noise related to the mining activity could indirectly impact sage grouse reproductive success. Sage grouse leks close to active mining could be abandoned if mining-related noise elevates the existing ambient noise levels. Surface coal mining activity is known to contribute to a drop in male sage grouse attendance at leks close to active mining, and over time this can alter the distribution of breeding grouse (Remington and Braun 1991). Because sage grouse populations throughout Wyoming have been declining over the past several years, this impact could be significant to the local population when evaluated with the cumulative impacts of all energy-related development occurring in the area.

The existing and proposed mines in the Sheridan Coal Field would cumulatively cause a reduction in habitat for other mammal and bird species. Many of these species are highly mobile, have access to adjacent habitats, and possess a high reproductive potential. The existing mines and the proposed Ash Creek Mine are not contiguous, and habitat adjacent to and between existing and proposed mines include sagebrush shrublands, upland grasslands, bottomland grasslands, improved pastures, haylands, wetlands, riparian areas, and ponderosa pine woodlands. As a

result, these species should respond quickly and invade suitable reclaimed lands as reclamation proceeds. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas in the eastern PRB was slightly less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992).

Cumulative impacts on fish habitat and populations would be minimal because local drainages generally have limited value due to intermittent or ephemeral flows. Some of the permanent pools along drainages support minnows and other nongame fish, and the larger impoundments and streams in the area which have fish populations would be restored following mining.

The additional discussions of cumulative impacts to wildlife from coal development and industrialization of the PRB that are discussed in BLM regional EISs covering this area (BLM 1981, 1984) are incorporated by reference into this EIS.

If the exchange is completed and P&M submits a detailed permit application package to WDEQ, the cumulative impacts of mining the PSO Tract will be assessed within the WGFD's and the WDEQ/LQD's review of the mine permit application and the WDEQ/LQD's permit approval process.

4.8.10 Threatened, Endangered, Proposed, and Candidate Plant and Animal Species

Refer to Appendix E.

4.8.11 Land Use and Recreation

Surface coal mining reduces livestock grazing and wildlife habitat, limits access to public lands that are included in the mining area, and disrupts oil and gas development. In addition, when oil and gas development facilities are present on coal leases, all associated facilities and equipment must be removed prior to mining. Mining the coal prior to the recovery of all of the CBM resources from the coal bed being mined releases CBM into the atmosphere. The potential impacts of conflicts between CBM and coal development are discussed in Section 4.4.2.

Cumulative land use and recreation impacts resulting from energy extraction in the PRB include a reduction of livestock grazing and subsequent revenues, a reduction in habitat for some species of wildlife (particularly pronghorn, sage grouse, and mule deer), and loss of recreational access to public lands (particularly for hunters). Mining the PSO Tract would not affect access to public lands because only 6.41 acres of public lands are included on the tract.

The increased human presence associated with the cumulative energy development in the eastern PRB has increased the potential for legal and illegal hunting. Conversely, surface coal mines tend

to become refuges for big game animals during hunting seasons since they are often closed to hunting. Reclaimed areas are attractive forage areas for big game. As an example, reclaimed lands at the Jacobs Ranch Mine in the eastern PRB have been declared crucial elk winter habitat by WGFD (Oedekoven 1994).

Energy development-related indirect impacts to wildlife have and will continue to result from human population growth. Energy development has been the primary cause of human influx into the PRB. Mining the PSO Tract under the Proposed Action would provide employment for up to 20 years. Development of the PSO Tract and the ensuing employment increase may increase demand for recreational opportunities in Sheridan County.

The demand for outdoor recreational activities, including hunting and fishing, has increased proportionately as population has increased. However, at the same time these demands are increasing, wildlife habitat and populations are being reduced. This conflict between decreased habitat availability and increased recreational demand has had (or may have) several impacts: demand for hunting licenses may increase to the point that a lower success in drawing particular licenses will occur; hunting and fishing, in general, may become less enjoyable due to more limited success and overcrowding; access to private lands for hunting and fishing may become more limited and expensive; poaching may increase; the increase in people and traffic has and may continue to result in shooting of nongame species and road kills; and increased off-road activities have and will continue to result in disturbance of wildlife during sensitive wintering or reproductive periods.

4.8.12 Cultural Resources

In most cases, treatment of cultural sites that are eligible for the NRHP is confined to those that would be directly impacted by mining, while those that may be indirectly impacted receive little or no consideration unless a direct mine-associated effect can be established. The higher population levels associated with coal development coupled with increased access to remote areas can result in increased vandalism both on and off mine property. Development of lands in which coal is strip-mineable (shallow overburden) may contribute to the permanent unintentional destruction of segments of the archeological record.

A majority of the known cultural resource sites in the PRB are known because of studies at existing and proposed coal mines. Clearly, a number of significant sites, or sites eligible for nomination to the NRHP, have been or will be impacted by coal mining operations within the PRB. Ground disturbance, the major impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigation measures such as stabilization, restoration, or moving

of buildings may cause adverse impacts to context, in-place values, and overall integrity. Additionally, loss of sites through mitigation can constitute an adverse impact by eliminating the site from the regional database and/or affecting its future research potential.

Beneficial results or impacts can also occur from coal development. Valuable data are collected during cultural resource surveys. Data that would otherwise not be collected until some time in the future, or lost in the interim, are made available for study. Mitigation also results in the collection and preservation of data that would otherwise be lost. The data that has been and will be collected provides opportunities for regional and local archeological research projects.

4.8.13 Native American Concerns

If the exchange is completed as proposed and the PSO Tract is mined, no cumulative impacts to Native American traditional values or religious sites have been identified. Native American groups can request additional information and can tour the area upon request.

4.8.14 Paleontological Resources

Impacts to paleontological resources as a result of the already-approved cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and will result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

4.8.15 Visual Resources

A principal visual impact in this area is the visibility of mine pits and facility areas. People most likely to see these facilities would either be local residents, those passing through the area, or those visiting it on mine related business. Pits and mine support facilities are generally not visible from more than a few miles away, but coal loading facilities and draglines can be seen from farther away. Due to the distance between mining operations, cumulative overlap of mining-related visual impacts is not likely.

After mining, the reclaimed slopes might appear somewhat smoother than pre-mining slopes and there would be fewer gullies, bluffs, and rock outcrops than at present. Even so, the landscape of the reclaimed mine would look very much like undisturbed landscape in the area and, in this area, the reclaimed mine areas would be separated by areas where the topography is not disturbed.

4.8.16 Noise

Existing land uses within the PRB (e.g., mining, livestock grazing, oil

and gas production, transportation, and recreation) contribute to noise levels, but wind is generally the primary noise source. Mining on the PSO Tract would increase the number of noise-producing facilities within the area and may augment the level of impacts to other resources (e.g., increased exposure of wildlife to noise impact, increased noise impacts to local residents and recreational users). Mining-related noise is generally masked by the wind at short distances, so cumulative overlap of noise impacts between mines is not likely.

Recreational users, local residents and grazing lessees utilizing lands surrounding active mining areas do hear mining-related noise; but this has not been reported to cause a substantial impact. As stated above, wildlife in the immediate vicinity of mining may be adversely affected by noise; however, observations at other surface coal mines in the PRB indicate that wildlife generally adapt to noise conditions associated with active coal mining.

Cumulative increases in noise from trains serving the PRB mines have caused substantial increases (more than five dBA) in noise levels along segments of the rail lines over which the coal is transported to markets. However, no substantial adverse impacts have been reported as a result.

4.8.17 Transportation Facilities

New or enhanced transportation facilities (roads, railroads, and pipelines) are expected to occur as a result of energy development in the PRB. However, no new cumulative impacts to transportation facilities are expected to occur as a direct result of the proposed exchange and subsequent mining of the PSO Tract. Excluding the 24,000 ft overland conveyor that P&M proposes to construct between the mine to the BNSF mainline to the south, the transportation facilities for the proposed Ash Creek Mine are already in place.

4.8.18 Socioeconomics

Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Each of these basic industries is important, and the extractive mineral industry has long been a vital part of Wyoming's economy. Many Wyoming communities depend on the mineral industry for much of their economic well being. The minerals industry is by far the largest single contributor to the economy of Wyoming. The 2002 valuation on minerals produced in 2001 was $6,738,726,062. This was 60 percent of the state's total valuation and placed Wyoming among the top ten mineral producing states in the nation (Wyoming Business Council 2003). Because most minerals are taxed at 100 percent of their assessed valuation, this makes the mineral industry a significant revenue base for both local and state government in Wyoming.

From 1986 through 2000, coal production in Wyoming increased by over 203 percent, an average of 5.2

percent per year. WSGS projects coal production in the state to increase by about four percent per year from 2002 through 2005, with most of the increase occurring in Campbell County. In 1999, Wyoming coal supplied approximately 31 percent of the United States' steam coal needs; PRB coal was used to generate electricity for public consumption in 27 states as well as Canada and Spain (Lyman and Hallberg 1999). PRB coal fueled nearly a third (32 percent) of the nation's coal-fired power plants in 2001 (WSGS 2001b). Electricity consumers in those states have benefited from low prices for PRB coal, from cleaner air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal.

Locally, continued sale of PRB coal helps stabilize municipal, county, and state economies. By 2005, annual coal production is projected to generate about $2.6 billion of total economic activity, including $351 million of personal income, and support the equivalent of nearly 15,885 full-time positions (BLM 1996a).

Although coal mining has historically been an important part of the economy of Sheridan County, this is no longer the case. The 2002 valuation on 2001 production of all minerals in Sheridan County was $35,851,556, or about 0.5 percent of the state's total (Wyoming Business Council 2003). Final reclamation of the Big Horn Mine was completed by 2001; therefore, the only coal mining in the vicinity occurs at the Decker and Spring Creek Mines in Montana. Although most of the employees at these mines live in Sheridan, most of the tax benefits go to Montana.

Aside from natural gas (CBM), mineral commodity production in Sheridan County is projected to decline over the next five years (Wyoming Business Council 2003). The rate of CBM development in Sheridan County was impacted by the lack of a way to dispose of the produced water (refer to Section 4.4.2 in this document). Southeastern Montana irrigators, CBM producers, and the MDEQ have been discussing water releases and water quality issues in the Tongue River drainage basin. A compromise was reached on March 28, 2003 and the State of Montana adopted numeric limits in water quality standards for CBM discharge water. Those limits are related to the irrigation season and the Tongue River's seasonal discharge rate (Billings Gazette March 2003). In addition, the Wyoming BLM's preferred alternative (Alternative 2A) in the *Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project* (BLM 2003a) emphasizes the use of infiltration impoundments to dispose of CBM produced water. These recent solutions to the issue of how CBM produced water will probably be handled in the future should translate into an increase in CBM well drilling in Sheridan County. CBM development in the county should therefore experience slow, but steady sustained growth over the next 10 to 15 years (Kristiansen 2003).

4.9 The Relationship Between Local Short-term Uses of Man s Environment and the Maintenance and Enhancement of Long-term Productivity

From the fifth year of operations on, the proposed Ash Creek Mine would plan to produce coal at an average production level of 10 million tons per year for 13 years under the Proposed Action (Table 2-1). As the coal in the PSO Tract is mined, almost all components of the present ecological system, which have developed over a long period of time, would be modified. In partial consequence, the reclaimed land would be topographically lower, and although it would resemble original contours, it would lack some of the original diversity of geometric form.

The forage and associated grazing and wildlife habitat that the PSO Tract provides would be temporarily lost during mining and reclamation. During mining of the PSO Tract there would be a combined loss of native vegetation on 2,595 acres with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur incrementally over a period of years. The mine site would be returned to equivalent or better forage production capacity for domestic livestock before the performance bond is released. Long-term productivity would depend largely on post-mining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb pronghorn and other big game habitat, but the PSO Tract would be suitable for pronghorn following successful reclamation. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to pre-mining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance. Reestablishment of mature sagebrush habitat--which is crucial for pronghorn and sage grouse--could take even longer.

There are several coal seams that have been identified as potentially economic CBM reservoirs in this area (Dietz 3, Monarch, and Carney). P&M proposes to mine the uppermost of those coal beds (Dietz 3) starting about 2008, depending on the coal market. Mining the Dietz 3 seam would allow CBM in that seam to be vented to the atmosphere. Removal of the Dietz 3 coal seam would not directly affect the CBM resources in the lower Monarch and Carney coal seams but would delay CBM recovery from those seams. During that delay, the CBM in those seams could be drained by wells drilled on lands adjacent to the PSO Tract. Several CBM wells have been drilled on the tract and more are proposed. As of April 2003, two CBM wells on the PSO Tract were producing. Depending on how quickly CBM wells are drilled and produced, it is likely that a substantial portion of

the CBM on the PSO Tract could be recovered prior to mining.

Methane is a greenhouse gas that contributes to global warming. According to the EIA/DOA, U.S. anthropogenic methane emissions totaled 28.0 million metric tons in 2001, which was down from 28.7 million metric tons in 1999 (U.S. Department of Energy 2002). U.S. 2001 methane emissions from coal mining were estimated at 2.78 million metric tons, down from 3.12 million metric tons in 1999. There has been a 34.3 percent decrease in methane emissions from coal mines since 1990, which the report attributes to an increase in methane recovery from coal mines and a shift in production away form gassy mines. According to Table 14 of this report, surface coal mining was estimated to be responsible for about 0.53 million metric tons of methane emissions in 2001, but this number was reported as preliminary. This represents about 1.89 percent of the estimated U.S. anthropogenic methane emissions in 2001, and about 19.06 percent of the estimated methane emissions attributed to coal mining of all types. Based on the 2001 coal production figures, it is estimated that Wyoming and Montana PRB surface coal mines were responsible for approximately 0.98 percent of the estimated U.S. anthropogenic methane emissions in 2001.

Total U.S. methane emissions attributable to coal mining would not likely be reduced if the federal coal is not exchanged and the PSO Tract is not mined at this time because total U.S. coal production would not decrease if this tract is not mined. However, the methane on this tract would potentially be more completely recovered if mining operations are delayed, depending on how fast development of the CBM resource occurs relative to when mining operations begin.

There would be a deterioration of the groundwater quality in the PSO Tract area because of mining; however, the water quality would still be adequate for livestock and wildlife. The deterioration in water quality would probably occur over a long period of time. As a result of mining, depth to groundwater would increase only within about one and one-half miles away from, and northeast of, the pits in the Dietz 1/Dietz 3 coal aquifer during mining. The water levels in the coal aquifer should return to pre-mining levels at some time (probably less than 100 years) after mining has ceased.

Mining operations and associated activities would degrade the air quality and visual resources of the area on a short-term basis. Following coal removal, removal of surface facilities, and completion of reclamation, there would be no long-term impact on air quality. The long-term impact on visual resources would be negligible.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance. These changes would primarily impact hunting in this general area. However, P&M does not presently allow hunting on the portion of the surface of the PSO

Tract. Reclamation would result in a wildlife habitat similar to that which presently exists, so there should be no long-term adverse impacts on recreation.

The Proposed Action would enhance the economy of the region for 20 years.

4.10 Irreversible and Irretrievable Commitments of Resources

The major commitment of resources would be the exchange of 107 million tons of federal coal which would be mined and consumed for electrical power generation. CBM that is not recovered prior to mining would also be irreversibly and irretrievably lost (see additional discussion of the impacts of venting CBM to the atmosphere in Section 4.9). It is estimated that one or two percent of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 2,595 acres 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.

Direct and indirect wildlife deaths caused by mining operations or associated activity would be an irreversible loss.

Loss of life may conceivably occur due to the mining operation and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming as determined by the Mine Safety and Health Administration (1997) for the 10-year period 1987-1996, fatal accidents (excluding contractors) occur at the rate of 0.003 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 man-hours worked. Any injury or loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown cultural or paleontological values would be irreversible and irretrievable.

5.0 CONSULTATION AND COORDINATION

In addition to this EIS, other factors and consultations are considered and play a major role in determining the decision on this proposed exchange. These include the following.

Regional Coal Team Consultation. The P&M Exchange Proposal was reviewed and discussed at the February 23, 1999 PRRCT public meeting held on October 27, 1999 in Gillette, Wyoming. P&M presented information about their proposed exchange to the PRRCT at this meeting. The PRRCT recommended that the BLM continue to process the exchange and instructed BLM to proceed with an EIS to evaluate the environmental effects of the exchange.

Public Notice. The BLM published the Notice of Exchange Proposal for four consecutive weeks, as required by the regulations at 43 CFR 2201.2(a) in the following newspapers:

- Rawlins Daily Times - December 22, 28, 2000, January 4, 11, 2001;
- The Kemmerer Gazette - December 21, 28, 2000, January 4, 11, 2001;
- The Daily Rocket-Miner - December 21, 28, 2000, January 4, 11, 2001;
- The Sheridan Press - December 21, 28, 2000, January 4, 11, 2001.

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

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

A Notice of Availability for the Draft EIS was published in the *Federal Register* on May 24, 2002. The 60-day comment period on the Draft EIS ended on July 23, 2002. BLM received 21 written comment letters on the Draft EIS, which are included, with responses, as Appendix I in this Final EIS. After the Final EIS is published, a public meeting will be held to receive public comments on the public interest factors of the proposed exchange, as required by 43 CFR 2203.3.

Attorney General Consultation. After the Final EIS is published and the public meeting or meetings are held, the BLM will forward to the U.S. Attorney General copies of the comments received in response to the request for public comments, the transcript of the public meeting or meetings, and copies of written comments received at the public meeting or meetings.

Other Consultations. Other federal, state, and local governmental agencies that were directly consulted in preparation of this EIS are listed in Table 5-1.

List of Preparers. This EIS was prepared by WWC Engineering, a third-party contractor, under the direction of the BLM. Representatives from cooperating agencies contributed to and participated in the NEPA process. Tables 5-2 and 5-3 provide listings of the BLM, OSM, and USFS interdisciplinary team and the third-party consultant personnel who prepared and reviewed this EIS.

Distribution List. This EIS was distributed to numerous Congressional offices, federal agencies, state governments, local governments, industry representatives, interest groups, and individuals for their review and comment (Table 5-4).

Table 5-1. Other Federal, State, and Local Governmental Agencies Consulted in EIS Preparation.

Agency or Organization	Individual	Position
Powder River Regional Coal Team	5 Voting Members and 21 Nonvoting Members	Advisory Group
Wyoming Game and Fish Department	Lynn Jahnke	Wildlife & Fish Supervisor
Wyoming Department of Environmental Quality		
Air Quality Division	Darla Potter	Senior Analyst
	Judy Shamley	Senior Analyst
	Mike Warren	Senior Analyst
Land Quality Division	Doug Emme	Blasting Program Principal
	Bob Giurgevich	Assistant Supervisor
Water Quality Division	Maggie Davison	Senior Analyst
Abandoned Mine Lands Division	Tim Richmond	Senior Analyst
Wyoming Oil and Gas Commission	Don Likwartz	Supervisor
Wyoming Department of Commerce	Dale Hoffman	Mineral Tax Division Director

Table 5-1. Other Federal, State, and Local Governmental Agencies Consulted in EIS Preparation (continued).

Agency or Organization	**Individual**	**Position**
Wyoming Department of Information and Administration	Wenlin Liu	Division of Economic Analysis, Senior Economist
Wyoming Department of Revenue	Dean Ternte	Senior Economist
Montana Department of Environmental Quality		
Land Quality Division	Claudia Furiof	Head of Coal Bureau
Air Quality Division	Robert Jeffrey	Senior Analyst

Table 5-2. List of Contributors and Reviewers.

Name	Project Responsibility
	BLM Casper Field Office
Mike Karbs	Project Supervisor
	BLM Wyoming State Office
Bob Janssen	Coal Program Coordination
Janet Kurman	NEPA Coordination
Mel Schlagel	Exchange Coordination
Tamara Gertsch	Exchange Coordination
Susan Caplan	Air Quality and Climate
	BLM Buffalo Field Office
B.J. Earle	Cultural Resources
Tom Bills	Wildlife Resources
Larry Gerard	Wildlife Resources
John Kolnik	EIS Coordination
	BLM Rawlins Field Office
Larry Jackson	Exchange Coordination
Frank Blomquist	Wildlife/Vegetation Resources
Alberta Settle	Hazardous Materials Assessment
Andy Warren	Vegetation and Rangeland
	BLM Pinedale Field Office
Bill Wadsworth	EIS Coordination
	BLM National Science and Technology Center
Scott Archer	Air Quality and Climate
	Office of Surface Mining Reclamation and Enforcement Western Regional Coordinating Center
Floyd McMullen	EIS Project Coordinator
	U.S. Forest Service Bridger-Teton National Forest
Mark Booth	EIS and Exchange Coordination
Jamie Schoen	Cultural Resources
Fred Fouse	Wildlife Resources

Table 5-3. List of Preparers.

Name	Education/Experience	Responsibility
	BLM Casper Field Office	
Nancy Doelger	M.S., B.S. Geology, 26 years professional experience	EIS Project Leader/Editor
Ed Heffern	M.S., B.S. Geology, 27 years professional experience	Welch Ranch Coal Fire Report main author
	WWC Engineering-Third Party Contractor	
Ken Collier	B.S. Geology, 24 years professional experience (Licensed Wyoming Geologist)	Project Management Report Preparation
Doyl Fritz	M.S., B.S. Civil Engineering, 31 years professional experience (Licensed Professional Engineer)	Report Preparation
Mal McGill	2 years professional experience	CADD
Rodney Ventling	11 years professional experience	CADD
Heidi Robinson	10 years professional experience	Document Production
	Intermountain Resources-Subcontractor	
Jim Orpet	M.S., B.S. Wildlife Management, 23 years professional experience	Physical Resources
Russell Tait	B.S. Wildlife Management, 10 years professional experience	Physical Resources
Bill Glenn	B.S. Agronomy, 33 years professional experience	Soil Baseline
	GCM Services, Inc.-Subcontractor	
David Ferguson	M.A. Anthropology, 14 years professional experience	Cultural Resources
Garren Meyer	B.A. Anthropology, 10 years professional experience	Cultural Resources
	McVehil-Monnett Associates, Inc.-Subcontractor	
William R. Monnett	B.S. Meteorology, 23 years professional experience	Air Quality
George E. McVehil	Ph.D. CCM, B.S. M.S., Ph.D. Meteorology, 40 years professional experience.	Air Quality
	Argonne National Laboratories	
Kyong C. Chun	PhD. Environmental Health Engineering, 30 years professional experience	Cumulative Air Quality Impact Assessment
Young-soo Chang	Ph.D. Chemical Engineering, 20 years professional experience	Cumulative Air Quality Impact Modeling

Table 5-4. Distribution List - Final EIS.

Powder River Regional Coal Team Voting Members		
Honorable Judy Martz Governor of Montana	Honorable Dave Freudenthal Governor of Wyoming	Bob Bennett BLM Wyoming State Director
Martin Ott BLM Montana State Director	Alan Rabinoff BLM Deputy State Director Minerals and Land	
Powder River Regional Coal Team Non-Voting and Alternate Voting Members		
Big Horn County Planning Board, Montana	BLM Wyoming State Office	BLM Montana State Office
BLM Washington Office	Bureau of Indian Affairs Billings, Montana	Crow Tribal Council
Gillette Department of Community Development	Montana Office of the Governor	National Park Service, Devils Tower National Monument
U.S. Geological Survey Denver, CO	Northern Cheyenne Tribal Council	Office of Surface Mining Reclamation & Enforcement, Denver, CO
Powder River County, Montana	Rocky Mountain Regional Solicitor's Office Denver, CO	Rosebud County, Montana
U.S. Forest Service, Medicine Bow National Forest Laramie, WY	U.S. Forest Service, Douglas Ranger District Douglas, WY	U.S. Fish & Wildlife Service Cheyenne, WY
Bureau of Indian Affairs Billings, MT		
Congressional Offices		
U.S. Congresswoman Barbara Cubin Casper, WY Rock Springs, WY	U.S. Senator Craig Thomas Casper, WY Sheridan, WY Rock Springs, WY	U.S. Senator Mike Enzi Casper, WY Gillette, WY Jackson, WY
Federal Agencies		
BLM Washington, D.C. Rawlins, WY Pinedale, WY Buffalo, WY Miles City, MT Casper, WY	Bureau of Indian Affairs Washington, D.C. Denver, CO Bureau of Reclamation Denver, CO Washington, D.C.	Environmental Protection Agency Denver, CO Washington, D.C. Federal Highway Administration Washington, D.C.
Minerals Management Service Herndon, VA Denver, CO	National Park Service Lakewood, CO Washington, D.C. Kemmerer, WY	Office of Environmental Policy Washington, D.C.
Office of Surface Mining Reclamation and Enforcement Casper, WY Washington, D.C.	U.S. Army Corps of Engineers Omaha, NE Cheyenne, WY	U.S. Forest Service Lakewood, CO Kemmerer, WY Washington, D.C.

Table 5-4. Distribution List - Final EIS (continued).

Federal Agencies (continued)

U.S. Department of Energy
Casper, WY

U.S. Department of the Interior
Denver, CO

U.S. Geological Survey
Cheyenne, WY
Washington DC

U.S. Fish & Wildlife Service
Washington, D. C.

State Government

Rep. Jack Landon
Sheridan, WY

Rep. Rosie Berger
Sheridan, WY

Rep. Jerry Iekel
Sheridan, WY

Rep. Douglas Osborn
Buffalo, WY

Rep. George Bagby
Rawlins, WY

Rep. Kurt Bucholz
Saratoga, WY

Rep. Stan Cooper
Kemmerer, WY

Rep. Randall Luthi
Freedom, WY

Senator Bruce Burns
Sheridan, WY

Senator Delaine Roberts
Etna, WY

Senator John Schiffer
Kaycee, WY

Senator Bill Vasey
Rawlins, WY

State Agencies

Montana Department of Environmental Quality
Helena, MT

Wyoming Water Development Commission
Cheyenne, WY

Wyoming State Engineer's Office
Cheyenne, WY

Wyoming State Historic Preservation Office
Cheyenne, WY

Wyoming Oil & Gas Conservation Commission
Casper, WY

Wyoming State Geological Survey
Laramie, WY

Wyoming Industrial Siting Division
Cheyenne, WY

Wyoming Snowmobile Program Manager
Cheyenne, WY

Wyoming State Inspector of Mines
Rock Springs, WY

Wyoming Parks & Cultural Resources Department
Cheyenne, WY

Wyoming Public Service Commission
Cheyenne, WY

Wyoming Department of Environmental Quality
Cheyenne, WY
Sheridan, WY

Wyoming Division of Economic Analysis
Cheyenne, WY

Wyoming Department of Transportation
Cheyenne, WY

Wyoming Department of Agriculture
Cheyenne, WY

Wyoming Department of Employment
Research and Planning
Casper, WY

Wyoming Game and Fish Department
Cheyenne, WY
Sheridan, WY
Kemmerer, WY
Cokeville, WY
Green River, WY
Pinedale, WY

Wyoming State Clearinghouse
Cheyenne, Wyoming

Wyoming Business Council
Cheyenne, WY

Office of Federal Land Policy
Cheyenne, WY

Table 5-4. Distribution List - Final EIS (continued).

City and County Governments		
Sheridan County Commission	Lincoln County Commission	Carbon County Commission
Sublette County Commission	Fremont County Commission	Sweetwater County Commission
Mayor of Sheridan	Mayor of Cokeville	Mayor of Diamondville
Mayor of Evanston	Mayor of Kemmerer	Mayor of La Barge
Lincoln County Planner	Mayor of Afton	
Indian Tribes and Tribal Governments		
Cheyenne River Sioux Tribe	Clifford Long Sioux	Crow Creek Sioux Tribal Council
Crow Tribal Administration	Shoshone Business Council	Shoshone Spiritual Leader Delphine Clair
Shoshone Spiritual Leader Haman Wise	Shoshone Tribal Attorney	Flandreau Santee Sioux Executive Committee
Lower Brule Sioux Tribe	Arapaho Spiritual Leader Bobby Joe Goggles	Arapaho Business Council
Northern Cheyenne Cultural Committee	Northern Cheyenne Traditional Spokesperson Steven Brady	Northern Cheyenne Tribal Council
Oglala Sioux Tribal Council	Oglala Sioux Tribal Administration	Rosebud Sioux Tribe
Santee Sioux Tribal Council	Southern Cheyenne/ Southern Arapaho Tribal Offices	Standing Rock Sioux Agency
William C'Hair	Shoshone Bannock Tribes Fort Hall Idaho	Sicangu Lakota Treaty Council
Howard Antelope, Sr.		
Industry and Business		
American Colloid Company	Antelope Coal Company	Aqua Terra Consultants
Ark Land Company	Belle Ayr Mine	Bjork, Lindley, Danielson, & Baker
Bridgeview Coal Company	Buckskin Mine	Burlington Northern Railroad Company
Burns & McDonnell	C.H. Snyder Company	CE&MT, Inc
CH2M Hill	Consol, Inc.	Cordero-Rojo Mine Complex
Davis & Cannon	Decker Coal Company	Diamond H Ranch
Dry Fork Coal Company	Ducker, Montgomery, Lewis, & Aronstein, P.C	Eagle Butte Mine
ECC	El Paso Production Company	ENCOAL
Environmental Solutions	Evergreen Enterprises	Exxon Company USA
Farleigh Oil Properties	Flying E Ranch	Foster-Wheeler Environmental
Glenrock Coal Company	Greystone	Hardin & Associates

Table 5-4. Distribution List - Final EIS (continued).

Industry and Business (continued)		
Independent Production Company	Institute for Policy Research, Northwestern University	Intermountain Resources
International Alcoholic Treatment	Irox Ranch	J.M. Huber Corporation
Jacobs Ranch Coal Corporation	Kennecott Energy Company	Kenneth R. Paulsen Cons.
Kfx Wyoming Inc.	Kiewit Mining Group	KN Energy
L.E. Peabody & Associates	M & K Oil Company, Inc.	Marston & Marston
McCarty Canyon Ranch	McGraw-Hill	McVehil-Monnett Associates, Inc.
Meineadair Consultants	Mine Engineers, Inc.	Mining Associates of Wyoming
Nerco Coal Company	North Rochelle Mine	Norwest Mine Services
P&M Coal Mining Company	Pacificorp	Pacificorp/Interwest Mng.
Padlock Ranch Company	PIC Technologies	Poudre Environmental Consultants
Powder River Energy Corporation	Powder River Coal Company	RAG Coal West Inc.
Range Telephone Coop.	Redstone Resources	Reserve Coal Properties
Riverside Technology, Inc.	Royal Gold, Inc.	San Juan Coal Company
Shea & Gardner	Shell Mining Company	Stone & Wolf, LLC
The Rim Companies	Thompson Logging	Three Forks Ranch
Thunder Basin Coal Company	Thunderbird Wildlife Consulting	Torch Energy
TRC Environmental	Triton Coal Company	URS Greiner Woodward Clyde
U.S. West Communications, Inc.	Utah Power & Light Property Service	V Cross Cattle Company
Wal-Mart	Western Energy Company	Western Fuels Association
Western Gas Resources	WWC Engineering	Wyodak Resources Development Corp.
Yates Petroleum Company	Williams Production RMT	
Interest Groups and Professional Societies		
Advisory Council on Historic Preservation	Alliance for the Wild Rockies	American Wildlands
Big Horn Audubon Society	Cheyenne High Plains Audubon Society	Foundation for North American Wild Sheep
Biodiversity Conservation Alliance	Greater Yellowstone Coalition	Izaak Walton League of America
La Barge Area Public Land Users	Lincoln-Uinta Association of Gov.	Medicine Wheel Coalition
Murie Audubon Society	National Mining Association	People for the West

Table 5-4. Distribution List - Final EIS (continued).

Interest Groups and Professional Societies (continued)

People for Wyoming	Petroleum Association of Wyoming	Pheasants Forever
Powder River Basin Resource Council	Sierra Club	The Fund for Animals
The Nature Conservancy Public Lands Project	Trout Unlimited	Wildlife Management Institute
Wind River Multiple Use Advocates	Wyoming Association of Professional Archeologists	Wyoming Bankers Association
Wyoming Business Council	Wyoming Geological Association	Wyoming Mining Association
Wyoming Outdoor Council	Wyoming Public Lands Council	Wyoming Stock Growers Association
Wyoming Wildlife Federation	Wyoming Wool Growers Association	Western Land Exchange

Media

Associated Press	Casper Journal	Casper Star-Tribune
Cheyenne-Wyoming Eagle	Coal Daily	Douglas Budget
Gillette News Record	Rocky Mountain Oil Journal	Western Coal Newsletter
Sheridan Press	Rawlins Daily Times	Kemmerer Gazette
Rock Springs Rocket Miner	KSGT Radio	

Libraries

Colorado State University Libraries	Department Of the Interior Natural Resources Library	University of Wyoming Libraries
OSM Technical Library		

Individuals

Todd Anderson	Helen Anelli	George Baker
Ralph Barbero	Calvin Barnes	Scott Benson
Jeff Bertot	Sheldon Bierman	Mike Blenkush
Eugene Call	Craig Chadwick	Bob and Nancy Combs
Steve and Linda Cox	Don Crecelius	Robert Crooks
Cecil Cundy	Arnold Cunningham	Shelly Damon
L.N. Davis	Jerry Daub	Sharon Dayton
Neil Delapp	Mark Domek	Clint Erickson

Table 5-4. Distribution List - Final EIS (continued).

Individuals (continued)		
David Eugster	Robin Gregory	Dan Hadley
Leo Hakola	Pam Hamilton	Jerry Hansen
Ted Harmon	Lillian Harrower	Lee Helvey
Michael Helvey	Steve Hoffman	Jim & Lynn Howe
Mike Hunzie	Gerald Jacob	Bruce Jones
Brian Kennedy	William Krall	Frank Lentz
Clayton Lunde	Louis Madrid Trust	Dean McClure
Frank & Mary Mommsen	Celia Myres	Bill Nation
F.L. Natta	Ray Okelberry	Ed Patterson
Anthony Poeschl	Lori Roberts	C.J. Robertson
Gene Robinson	Bill Saulcy	Milton Schreibeis
Lloyd Schreibeis	Norman Schreibeis	Mike Shaffer
Lonnie Smith	Bill Thek	Blaine Thoman
Thomas Thrash	Norris Tratnik	Ray & Pam Tucker
Ralph Urbigheit	Jim Vilos	J. Michael Watkins
John Williams	John Willson	Mark Winland
Clyde Wolfley	Art Zeiger	

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7.0 GLOSSARY

ad valorem tax - A tax paid as a percentage of the assessed value of property.

adverse impact -An apparent direct or indirect detrimental effect.

alkalinity - The degree to which the pH of a substance is greater than 7.

alluvial deposit - Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

alluvial valley floors (AVFs) - An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

alluvium - Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its flood plain or delta.

alternative - In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

ambient -Surrounding conditions (or environment) in a given place and time.

annual precipitation - The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

approximate original contour - Post-mining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

aquifer - A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use.

arithmetic mean - The sum of the values of n numbers divided by n. It is usually referred to as simply the “mean” or “average”.

ash - The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

backfill - The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

baseline - Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

beneficial impact - An apparent direct or indirect advantageous effect.

bentonite - A clay formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

bonus - That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals [see 43 CFR 3400.0-5(c)].

buffer zone - An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

CALMET - the meteorological module that is associated with the CALPUFF model.

CALPUFF - a long-range transport Gaussian puff air model.

clinker (scoria) - Baked and fused rock resulting from in-place burning of coal deposits.

coal bed methane - Methane gas that is generated during the coal-forming process.

colluvium - Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

confluence - The point at which two or more streams meet.

contiguous - Lands or legal subdivisions having a common boundary, lands having only a common corner are not contiguous.

cooperating agency - An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document [see 40 CFR 1501.6 and 1508.5].

crucial wildlife habitat - Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

cultural resources - The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

cumulative impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

decibel - A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

deciview - A measure of view impairment (13 deciview equals a view of approximately 60 miles).

dip - The angle at which a rock layer is inclined from the horizontal.

direct (or primary) impact - An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

discharge - Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

dissected upland - An upland or high area in which a large part of the original surface has been deeply cut into by streams.

dragline - A type of excavating crane that casts a rope- or cable-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material on a backfill bank or pile.

eolian deposit - Sediment carried, formed, or deposited by the wind, as sand dunes.

ephemeral stream - A stream that flows occasionally because of surface runoff, and is not influenced by permanent ground water.

erosion - The wearing away of the land surface by running water, wind, ice or other geologic agents.

evapotranspiration - The sum total of water lost from the land by evaporation and plant transpiration.

excavation (archeological) - The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

fair market value - The amount in cash, or in terms reasonably equivalent to cash, for which in all probability a coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

fixed carbon - In coal, the solid combustible material remaining after removal of moisture, ash, and volatile matter. It is expressed as a percentage.

floodplain -The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream, that is covered with water when the river or stream overflows its banks.

forage - Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

formation (geologic) - A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

fossil - The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin are not considered to be fossils (e.g. oil, gas, asphalt, limestone).

geometric mean - The nth root of the product of the values of n positive numbers.

groundwater - Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

habitat - A place where a plant or animal naturally or normally lives and grows.

habituation - The process of becoming accustomed to, or used to, something; acclimation.

hazardous materials - Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons or damage to property.

hazardous waste - Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR § 261.

human environment - The natural and physical environment and the relationship of people with that environment (see 30 CFR 1508.14).

hydraulic conductivity - The capacity of a medium to transmit water; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

hydraulic - Pertaining to fluid in motion, or to movement or action caused by water.

hydric soil - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrocarbon - Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

hydrogeology - The science that deals with subsurface waters and with related geologic aspects of surface waters.

hydrology - The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

hydrophytic vegetation - The plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

impermeable - Not capable of transmitting fluids or gasses in appreciable quantities.

indirect (or secondary) impact - A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

in-place coal reserves - The estimated volume of all of the coal reserves in a lease without considering economic or technological factors which might restrict mining.

in-situ leach mining - Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock.

interbedded - Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

interburden - A layer of sedimentary rock that separates two mineable coal beds.

interdisciplinary - Characterized by participation or cooperation among two or more disciplines or fields of study.

intermittent stream - A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

land and resource management plan - A land use plan that directs the use and allocation of U.S. Forest Service lands and resources.

lead agency - The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

lease (mineral) - A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained [see 43 CFR 3400.0-5(r)].

lek - A traditional breeding area for grouse species where territorial males display and establish dominance.

lenticular - Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

limb (geologic) - One side of a fold (syncline or anticline).

lineament - A linear topographic feature of regional extent that is believed to reflect crustal structure.

loadout facilities - The mine facilities used to load the mined coal for transport out of the mine.

loam - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

maintenance tract - A federal coal tract that would continue or extend the life of an existing coal mine.

major federal action - An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

meteorological - Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

methane - A colorless, odorless, and inflammable gas; the simplest hydrocarbon; chemical formula = CH_4. It is the principal constituent of natural gas and is also found associated with crude oil and coal.

mineable coal - Coal that can be economically mined using present day mining technology.

mineral rights - The rights of one who owns the mineral estate (subsurface).

mining permit - A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

mitigation - An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

National Register of Historic Places (NRHP) - A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

natural gas - Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) which are in a gaseous phase at atmospheric conditions of temperature and pressure.

NEPA process - All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

no-action alternative - An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The no action alternative provides a baseline for estimating the effects of other alternatives.

outcrop -A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

overburden - Material of any nature, consolidated or unconsolidated, that overlies a coal or other useful mineral deposit, excluding topsoil.

paleontological resource - A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

peak discharge or flow - The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

perennial species (vegetation) - Vegetation that lives over from season to season.

perennial stream - A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

permeability - The ability of rock or soil to transmit a fluid.

permit application package - A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

permit area - The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

physiography - Physical geography.

playa - The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

point source (pollution) - A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

pore volume - the amount of fluid necessary to fill the void space in an unsaturated porous medium (i.e., mine backfill).

postmining topography - The relief and contour of the land that remains after mining has been completed.

potentiometric surface - The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydrologic head.

predator - An animal that obtains food by killing and consuming other animals.

prime or unique farmland - Those lands which are defined by the Secretary of Agriculture in 7 CFR part 657 (*Federal Register* Vol. 4 No. 21) and which have historically been used for cropland (see 30 CFR 701.5).

proposed action - In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

raptor - Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

recharge - The processes by which groundwater is absorbed into a zone of saturation.

reclamation - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore the disturbed area for post-mining use.

record of decision (ROD) - A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

recoverable coal- The amount of coal that can actually be recovered for sale from the demonstrated coal reserve base.

resource management plan - A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

revegetation - The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

riparian - The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

royalty (mineral) - A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

runoff - That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

salinity - Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non saltwater areas, total dissolved solids is used as an equivalent term.

sandstone - A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

scoping - A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

scoria (clinker) - Baked and fused rock resulting from in-place burning of coal deposits.

sedimentation pond - An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

severance tax - A tax on the removal of minerals from the ground.

shale - A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

significant impact - A qualitative term used to describe the anticipated importance of impacts to the human environment as a result of an action.

siltstone - A fine-grained clastic rock consisting predominately of silt-sized particles.

socioeconomics - The social and economic situation that might be affected by a proposed action.

sodium adsorption ratio (SAR) - The ratio of the concentration of sodium cations to the combined concentration of calcium and magnesium cations in water. High values of SAR are indicative of potential problems in agricultural applications, as it implies a hazard of sodium replacing adsorbed calcium and magnesium, and this replacement is damaging to soil structure.

soil survey - The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

spontaneous combustion - The heating and slow combustion of coal and coaly material initiated by the absorption of oxygen.

stipulations - Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

storage coefficient - The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

stratigraphic - Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

subirrigation - In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

subbituminous -A lower rank of coal (35-45% carbon) with a heating value between that of bituminous and lignite, usually 8,300-11,500 Btu per pound. Subbituminous coal contains a high percentage of volatile matter and moisture.

surface disturbance - Any disturbance by mechanical actions which alters the soil surface.

suspended solids - The very fine soil particles which remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

tectonic fracture - Fractures caused by deformation of the earth’s crust.

threatened and endangered (T&E) species - These species of plants or animals classified as threatened or endangered pursuant to section 4 of the Endangered Species Act. Any species which is in danger of extinction, or is likely to become so within the foreseeable future.

> ***Category 1*** - Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.

Category 2 - Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (U.S. Fish and Wildlife Service).

topography - Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

topsoil - The surface layer of a soil.

total dissolved solids (TDS) - The total quantity in milligrams per liter of dissolved materials in water.

transmissivity - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

truck and shovel - A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

unconfined aquifer - an aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

unsuitability criteria - The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

vegetation type - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

vertebrate fossils - The remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

visual resources - The physical features of a landscape which can be seen (e.g., land, water, vegetation, structures, and other features).

Visual Resource Management (VRM) - The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

volatile matter - In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

waterfowl - A bird that frequents water, especially a swimming bird.

wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs [see 33 CFR 328.3(a)(7)(b)].

wilderness - An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

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APPENDIX A

PROCESSING STEPS FOR
LAND EXCHANGES INVOLVING COAL
(43 CFR 2200)

Processing Steps for Land Exchanges Involving Coal
43 CFR 2200

- BLM and private landowners initiate exchange negotiations and discussions
- BLM receives a formal exchange proposal
- Analyze exchange proposal to determine if the public interest is served by the exchange proposal
- Prepare draft Notice of Exchange Proposal (NOEP)
- Review and approval of Draft NOEP by the Solicitor/Office of General Counsel*, the National Exchange Team(s), the WO Peer Review, & the Assistant Director Review
- Execute an Agreement to Initiate an Exchange (ATI). The ATI addresses the steps needed to process the specific exchange, including assignment of responsibilities, costs, and a proposed schedule
- Serialize case file and segregate public lands involved in exchange
- Hold EIS Scoping Meetings
- Initiate Appraisal
- Publish NOEP for 4 consecutive weeks in local newspaper(s)
- Prepare Draft EIS
- Notice of Availability of DEIS – Federal Register
- Distribute DEIS (includes County Commissioners, State Clearinghouse, Governor, Congressional Delegation, Tribal Governments, and other agencies, and notifying permittees, lessees, and adjoining landowners)
- Initiate Mineral Report on Federal land, and if necessary, on private land **
- Prepare Hazardous Material report on all lands
- Seek SHPO concurrence on exchange action
- Prepare T&E Species Report and initiate any necessary consultation ***
- Analyze public and interagency comments and revise DEIS as appropriate
- Prepare FEIS
- Interagency Review of draft FEIS (Including all BLM offices and USFS)
- Finalize FEIS
- Prepare notices, letters, and distribution list
- Submit NOA and Public Meeting Notice for WO Review
- Issue, print and mail FEIS; publish BLM/USFS* Notices and & Press Releases
- EPA Notice of Availability – Federal Register
- BLM Notice of Availability – Federal Register

- Hold Public Interest Meeting
- Finalize Appraisal and have independent review appraisals completed
- Evaluate comments received at the public interest meeting
- Complete public interest determination, and prepare draft ROD
- Submit draft ROD, NOA and Issue Paper to Solicitor/General Counsel* for review and concurrence
- Submit draft ROD, NOA, and Issue Paper for review and concurrence by the BLM/USFS* National Exchange Teams, Washington Office Peer Reviews
- BLM Director approves the exchange. The Forest Service will also need to approve the exchange if they are involved
- For all exchanges involving coal, the draft ROD is submitted to the Department of Justice for an anti-trust review. (This happens concurrently during the internal review of the draft ROD.)
- Sign ROD
- Publish ROD Notice of Availability - Federal Register
- Distribute ROD
- Allows 45 day protest period for Exchange Decision after the date on which the ROD was published. (This period accommodates both the timeframes provided by regulations at 43 CFR 2201.7-1(b), and by The National Environmental Policy Act Handbook (BLM 1988)
- Provide a right of appeal from a protest decision in accordance with procedures at 43 CFR Part 4
- Prepare Certificates of Inspection and Possession for the private lands. (Utilize BLM and USFS* forms as appropriate)
- Prepare draft deed(s) to non-Federal land; draft patent; and draft escrow instructions
- Request Preliminary Title Opinion from Solicitor and Office of General Counsel* on Deeds and Preliminary Title Commitment
- Prepare Supplemental Certificate of Inspection and Possession for the private lands. (Utilize BLM and USFS* forms as appropriate)
- Deliver executed patent and escrow instructions to closing company. Proceed with closing
- Send recorded deed(s) and title policy to Solicitor/Office of General Counsel* for Final Title Opinion(s). (Title to the Federal and Non-Federal land is transferred upon recordation of the documents in the County Clerk's or other local recorder's office.)
- Note Records; update LR 2000; and close case

* These steps are followed if the USFS is a party to the exchange.

** Analyzed during EIS process – BLM will only convey the coal underlying private surface. Almost all of the remaining mineral estate is privately owned, with low potential for development.

*** T&E Species consultation is being conducted as part of the EIS process.

APPENDIX B

FEDERAL AND STATE AGENCIES
AND PERMITTING REQUIREMENTS

APPENDIX B: FEDERAL AND STATE AGENCIES & PERMITTING REQUIREMENTS

Agency	Lease/Permit/Action
FEDERAL	
Bureau of Land Management	Coal Lease and/or Exchange Resource Recovery & Protection Plan Scoria Sales Contract Exploration Drilling Permit
Mine Safety and Health Administration	Safety Permit and Legal ID Ground Control Plan Major Impoundments Explosives Use and Storage Permit
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 and Other Waters of the U.S.
Department of Transportation	Hazardous Waste Shipment Notification
Federal Aviation Administration	Radio Tower Permits
STATE	
Department of Environmental Quality-Land Quality Division	Permit and License to Mine Reclamation Performance Bond
Department of Environmental Quality-Air Quality Division	Air Quality Permit to Construct Air Quality Permit to Operate
Department of Environmental Quality-Water Quality Division	National Pollutant Discharge Elimination System Water 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-Solid Waste Management Program	Solid Waste Disposal Permit-Permanent and Construction
State Engineer's Office	Appropriation of Surface Water Permits Appropriation of Ground Water Permits
Industrial Siting Council	Industrial Siting Certificate of Non-Jurisdiction
Department of Health	Radioactive Material Certificate of Registration

APPENDIX C

UNSUITABILITY CRITERIA FOR
THE PSO TRACT

Appendix C. Unsuitability Criteria for the PSO Tract

UNSUITABILITY CRITERIA	GENERAL FINDINGS FROM APPROVED RMP FOR PUBLIC LANDS ADMINISTERED BY BLM BUFFALO FIELD OFFICE (BLM 2001)	VALIDATION FOR PSO TRACT
1. Federal Land Systems. With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands Acquired through the Land and Water Conservation Fund, National Forests and federal lands in incorporated cities, towns and villages.	None of the listed federal lands categories are present within the study area.	None of the listed federal lands are present on the PSO Tract, and the tract therefore is not unsuitable for mining.
2. Rights-Of-Way and Easements. Federal lands that are within rights-of-way or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	The federal lands in the study area contain no rights-of-way that meet the intent of this criterion.	No rights-of-way or easements are on the federal lands on the PSO tract, and the tract therefore is not unsuitable for mining.
3. Dwellings, Roads, Cemeteries, and Public Buildings. Federal lands within 100 feet of a right-of-way of a public road or a cemetery; or within 300 feet of any public building, school, church, community or institutional building or public park; or within 300 feet of an occupied dwelling are unsuitable for mining.	No federal lands in the study area meet the intent of this criterion.	None of the listed rights-of-way or buildings are on the PSO Tract, and the tract therefore is not unsuitable for mining.
4. Wilderness Study Areas. Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
5. Lands with Outstanding Scenic Quality. Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in Sheridan County meet the scenic criteria as outlined.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	No lands in the general review area are under permit except small enclosures being used to gage reclamation success on existing mines.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
7. Historic Lands and Sites. All publicly or privately owned places which are included in or are eligible for inclusion in the National Register of Historic Places and an appropriate buffer zone are unsuitable.	On the basis of the consultation with the State Historic Preservation Office, there were no unsuitable findings under this criterion in the general review area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for T or E plant and animal species, and scientifically documented essential habitat for T or E species are unsuitable.	There is no habitat meeting federally designated criteria for T or E plant or animal species within the general review area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
10. State Listed Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as T or E shall be considered unsuitable.	Wyoming does not maintain a state list of T or E species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	The USFS found numerous eagle nests, and buffer zones were established. It was determined that coal leasing can occur within the buffer zone if the nests are protected with stipulations and site mitigation plans. There were no unsuitable findings under this criterion, but lands involved in buffer zones are subject to special lease stipulations.	No active eagle nests are found on the tract. There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.

UNSUITABILITY CRITERIA	GENERAL FINDINGS FROM APPROVED RMP FOR PUBLIC LANDS ADMINISTERED BY BLM BUFFALO FIELD OFFICE (BLM 2001)	VALIDATION FOR PSO TRACT
12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	No golden eagle roost or concentration areas occur in the general review area. Mining planned in the review area is not likely to jeopardize the continued existence of the bald eagle. Coal leasing can occur and adequate protection can be provided. There were no unsuitable findings in the general review area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
13. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	After consultation with USFWS, it was determined that this criterion does not apply in the general area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of high federal interest shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	After BLM's consultation with USFWS of intent to drop unsuitability designation of Lewis' woodpecker habitat within the PSO Tract, USFWS concurred August 2001; however, they requested that the scoria hillsides on the western edge of the exchange area be removed from the exchange or monitoring will be required in the mining permit.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish and wildlife habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable.	Sage grouse leks were found on and near the TBNG review area. However, methods of mining can be developed which will not have a significant long-term impact on the grouse or their habitat. Therefore, the areas involved in leks and buffer zones are not unsuitable.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	After consultation with the USGS, it was determined that floodplains can be mined with site specific stipulations and resource protection safeguards to be developed during mining and reclamation planning. Therefore, all lands within the general review area are not unsuitable for mining.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no municipal watersheds in the general review area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable.	There are no national resource waters in the general review area.	There are no unsuitable findings, and the PSO Tract therefore is not unsuitable for mining.
19. Alluvial Valley Floors. All lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Lands along prominent drainages were considered potential AVFs pending a final determination by the state. These lands are placed in an "available pending further study" category and are not considered unsuitable.	The State will make a final determination during the mine permit application review process. No heretofore undisturbed stream valleys are included in the PSO Tract, and there is no unsuitability finding.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	The state has no applicable criteria and there is no Indian tribe located in or near the planning area. Therefore there is no unsuitability finding.	There are no unsuitability findings for this criterion on the PSO Tract.

APPENDIX D

TECHNICAL REPORT ON THE WELCH RANCH COAL FIRE

Technical Report on the Welch Ranch Coal Fire
Sheridan County, Wyoming

April 28, 2003

By Ed Heffern, Branch of Solid Minerals, BLM Wyoming State Office (SO)
Jerry Queen, Buffalo Field Office (FO), and
Ken Henke, Division of Resources Policy and Management, BLM Wyoming SO

Description of Site Visits

On May 22, 2002, Richard Zander, Willy Frank, and Mike McKinley of the Buffalo FO, Ed Heffern and Ken Henke of the Wyoming SO, and Randy McKinley of the USGS EROS remote sensing data center in Sioux Falls, SD, visited the Welch Ranch along the Tongue River about nine miles north of Sheridan, Wyoming. This private ranch is owned by the Pittsburg and Midway Coal Mining Company (P&M), under their parent company ChevronTexaco, and is part of a proposed exchange for Federal coal in the Ash Creek area several miles northwest of the Welch Ranch.

We visited the area to evaluate concerns about a coal fire on the Welch Ranch property raised by Mr. Frank Mommsen, a local landowner, in a congressional inquiry from Senator Enzi of Wyoming. Mr. Mommsen has stated on several occasions that a coal fire was burning on the Welch Ranch north of the abandoned Acme mine. Some BLM staff had been aware of the fire since early in the exchange negotiations, when Western Water Consultants discussed and photographed the fire in an environmental site study prepared for the exchange (WWC 2001). The mineral report prepared for the exchange by Jerry Queen, the Buffalo Field Office geologist, also mentioned and photographed the fire (Queen 2000). However, this fire was only briefly mentioned in the draft EIS for the exchange proposal. On page 3-9 of the draft, after discussing reclamation of underground coal fires in the abandoned Acme Mine just south of the Welch Ranch, one sentence states: “Spontaneous coal fires still occur along outcrops adjacent to the Tongue River within the Welch lands, specifically in the southwest portion of T.58N., R.84W., Section 2 (WWC 2001)”. The actual location is in T.57N., rather than T.58N.

We saw evidence that the coal underlying a hillside between and north of two draws along the west bank of the Tongue River is actively burning, in the area of the proposed exchange. The day was cold, with drizzle and sleet, so we left after taking some pictures and videotape of the fire. The next day, BLM geologists Jerry Queen of the Buffalo FO and Ed Heffern of the Wyoming SO returned and used a Trimble Pathfinder Pro XR GPS unit to map the fissures and the extent of the fire, and an Industrial Scientific ATX 620 unit to collect oxygen, methane, and carbon monoxide spot readings at several fissures and vents (Photo 1). These data were downloaded into ArcView GIS to produce Figure 1 of this report.

Figure 1 shows that the treeless area associated with the coal fire covers about 13 acres. The lack of trees may be a result of the ground being too hot for plants with deep roots, or have something to do with fumes coming from the fissures. The coal underlying the upper part of the hillside appears to be actively burning, as evidenced by fissures several feet deep. Figure 2 is a black and white enlargement of a small part of a NAPP color infrared aerial photo of the Acme area, taken on September 20, 2001. The active coal fire is visible in the north central part of the picture as a treeless area along the west bank of the Tongue River. Fissures are especially visible along the north edge of the fire and the land surface appears to be slumping south and east towards the river. The northern limit of the fissures (and underground coal fire) is near the top of the hill (see Photo 2). In places, these fissures emit heat and vapor. At vent #6, the plastic funnel attached to the ATX 620 gas monitor partially melted as we were taking gas readings in the fissure about a foot below the surface (Photo 3). Gas readings in the fissures showed elevated levels of methane and carbon monoxide, and depleted levels of oxygen (Table 1). Methane concentrations varied from 100 to 5,000 ppm, and averaged 1,600 ppm. Carbon monoxide levels varied from 1 to 1,000 ppm and averaged 300 ppm; the two highest readings (1,000 ppm) were at the instrument's maximum detection limit and caused the over range alarm to go off. Oxygen levels varied from 18.0 to 20.8 percent and averaged 19.5 percent.

In the area where the coal is actively burning, only grass grows (Photos 4 and 5). Some burned logs are present. In the hottest areas, not even grass grows on the ground. Partly burned ponderosa pine and juniper trees are present along the perimeter of the fire; some of these have dead or discolored branches, probably due to the vapor and/or heat coming off the coal (Photos 6 and 7). The junipers grow in an unusual columnar fashion.

Table 1. Gas Readings at Welch Ranch Coal Fire.

Data Point	Carbon Monoxide (ppm)	Methane (ppm)	Oxygen (percent)
Vent 1	1	100	20.5
Vent 2	1,000	5,000	19.3
Vent 3	239	2,500	20.1
Vent 4	67	800	18.0
Vent 5	1,000	2,300	18.8
Vent 6	163	1,000	19.0
Vent 7	132	1,000	20.4
Vent 8	210	1,500	18.4
Vent 9	30	300	20.8
Hot Spot	158	1,500	19.9

In September of 2002, contractors for the Wyoming State Abandoned Mine Land Division, Department of Environmental Quality (AMLD), worked onsite to stabilize the north end of the fire. On September 17, 2002, Dennis Stenger and Richard Zander of the Buffalo Field Office toured the reclamation site with

Rodney Gaines of P&M. They discussed the reclamation efforts with David Murja of Spectrum Engineering (the AMLD consultant) and possible safety fencing and educational interpretation needs if BLM decides to acquire the site.

On September 26, 2002, Ed Heffern of the Wyoming State Office and Mike McKinley of the Buffalo Field Office returned to check the progress of the reclamation effort. The northern edge of the fire was in the final stages of being regraded (Photos 12–14). The foreman for the AMLD contractor, Everett Seaton of S&T Excavating in Thermopolis, Wyoming, said that they had worked on the site for the past three weeks with Spectrum Engineering to fill the fissures. The smaller cracks were excavated to the base of the crack (six to eight feet deep on average), filled with two feet of reject fines from crushed clinker (scoria), and backfilled the rest of the way with country rock. The larger cracks were filled with a slurry of clinker fines and water. A D-8 bulldozer was busy regrading the surface. The fissures on the steep hill to the south had not been reclaimed due to concerns about stability of the excavation equipment on the slope.

On the morning of February 25, 2003, Jerry Queen, Bob Hartman and Barney Whiteman of the Buffalo Field Office visited the Welch fire site. The air temperature was 15 to 20 degrees F., which was the warmest since a snowstorm had blanketed the area two days before. However, vapor was rising from areas of melting snow and bare spots and fissures were exposed in the regraded area near the top of the hill at the north end of the fire and along the ridge to the east. Snow covered the rest of the landscape, indicating that coal is still smoldering at depth despite the reclamation efforts. They took photographs and GPS measurements (Photos 15-16).

Geology

Figures 3 and 5 of this report provide a picture of the geology at the site. They are based on the structure and isopach maps for the Monarch, Dietz 2, and Dietz 3 coal beds (Figures 2.5-5, 6, and 7) and cross-sections A through D (Figures 2.5-8 through 12) in the geology section of the Welch No. 1 North mine permit application (Sheridan Enterprises 1983). Three coal beds are present below the surface of the hillside. They dip to the east at a slope of about 200 feet per mile. The uppermost Dietz 2 bed is about eight feet thick; its top drops from an elevation of about 3,730 feet in the west side of the active burn area to 3,700 feet on the east side. It has partially burned in prehistoric times to form clinker near the top of the hill. The Dietz 2 is separated by 80 to 90 feet of shale, siltstone, sandstone, and thin coal stringers from the underlying Dietz 3 bed, which is about 26 feet thick and whose top dips from an elevation of about 3,630 feet on the west side to 3,600 feet on the east side. The main burning at the site appears to be occurring in the Dietz 3 coal bed, which is between zero and 140 feet deep. A prehistoric burn of the Dietz 3 occurs in the draw a hundred yards north of the north end of the active fire. About 15 to 40 feet of

shale, siltstone, and sandstone separate the Dietz 3 from the underlying Monarch bed, which is about 16 feet thick and whose top dips from an elevation of about 3,580 feet on the west side to 3,540 feet on the east side at the edge of the Tongue River by the diversion dam. The Monarch bed is from zero to 180 feet deep. Data are lacking as to whether any of the Monarch bed has burned at the site; however, the Monarch has burned or is burning over a large area south of the Welch Ranch.

Aqua Terra Associates, Inc. of Sheridan, Wyoming, currently provides access to and manages activities on the Welch No. 1 North mine permit area for the Pittsburg-Midway Coal Company, along with Rodney Gaines of P&M. Julie Gerlach of Aqua Terra Associates is the mine manager.

The Welch fire is a few hundred yards north and east of the abandoned Acme No. 42 underground coal mine (Figure 4). According to Dunrud and Osterwald (1980), this mine was active from 1911 through 1940 and produced from the Monarch coal bed. Other records (WWC 2001) indicate that mining continued until about 1942 and produced from the underlying Carney bed as well as the Monarch coal bed. The Monarch bed has been burning sporadically due to air inflow from collapse of the rooms between the pillars in the old workings at the Acme mine. The Wyoming AMLD has done a number of reclamation and emergency rehabilitation projects over the past 20 years to extinguish these fires. As the fire advances in the Monarch bed, and the overburden collapses, the overlying Dietz 3 and Dietz 2 beds also collapse and the resulting set of fractures may be allowing oxygen in and causing these overlying beds to catch on fire as well (Figure 3 and Photos 8 and 9).

Mine maps obtained from the U.S. Office of Surface Mining's Mine Map Repository show that as of August 1940, the year that the Acme mine lost its lease, mining had advanced northward up to the boundary between Sections 2 and 11, and eastward to the boundary between Sections 2 and 3 (Figure 4). The mine maps show that most of the Monarch coal seam in the S2 SE of Section 3 was mined out, and that a prehistoric burn line kept the mine from advancing any further north. An entry had been driven diagonally into the SW SW corner of Section 2 but no mining was shown. However, it is possible that unauthorized mining could have advanced into the southwest part of Section 2 after that date. Earlier mining in Section 2 also occurred. Taff (1909, p. 141), in his U.S. Geological Survey Bulletin 341-B report on the Sheridan Coal Field, states that a Mr. Evans mined a coal bed (probably the Monarch) for domestic use in the south half of Section 2. Over 14 feet of this coal was exposed along the bank of the Tongue River, and the base was concealed below the water line. Plate VIII of his report shows an entry along the west bank of the Tongue River in the SW of Section 2. This mine could have underlain the area of the active fire. A fissure near the 3,560-foot elevation contour (see Figure 1) may mark collapse of the Monarch coal bed just above the level of the Tongue River in the active fire area. WWC (2001) reports that mine maps show that the Carney bed, as well as the overlying Monarch, was mined in the SE of Section 3.

Figure 5 shows the limits of the Acme mine in relation to the coal beds as mapped in the Welch No. 1 North mine permit application, on file with the Land Quality Division of the State Of Wyoming's Department of Environmental Quality. This application was filed in January 1983 by Sheridan Enterprises, Inc. Figure 5 was compiled by Spectrum Engineering, Inc., of Billings, Montana (Murja 2002, Attachment 3).

Current Activity and Research

A coal fire is eligible for full reclamation funding through AMLD's SMCRA program if:

1) the fire is the result of historic coal mining activity that occurred prior to the eligibility dates established in SMCRA;
2) the fire constitutes an extreme danger or potential adverse effect to public health, safety and property;
3) there is no responsible party with outstanding reclamation obligations for the site; and
4) if the site is located within the boundaries of an active coal mine permit area, the permittee must not have re-disturbed the site after the eligibility date. Currently, the area of the Welch fire is within the active permit area of the proposed Welch No. 1 North mine.

In addition to these considerations, AMLD prioritizes all potential reclamation sites based on the level of hazard, accessibility to the public, and budgetary constraints. In the case of mine fires, AMLD involvement may depend on the degree to which success is expected in controlling or extinguishing the fire.

The AMLD contracted with Spectrum Engineering to evaluate the Welch fire and perform emergency stabilization work. From September 9 through 27, 2002, David Murja of Spectrum Engineering, and the AMLD subcontractors, stabilized fissures at the north end of the Welch Ranch fire (Photos 12-14). Ernie Robb of the AMLD's Casper office and Kent Simon of the AMLD's Lander office served as project officers. The contractors graded the road to the top of the hill with a dozer and constructed a pad there, then excavated fissures, filled them with inert material, and regraded the slope. The control effort was limited to repairing and sealing cracks on top of the ridge at the north end of the site. The work was intended to reduce site hazards and to impede air circulation along the advancing edge of the underground fire by sealing cracks that were functioning as chimneys. The fissures on the hill at the south end of the fire (including vents 4, 7, 8, and 9 on Figure 1) were not reclaimed and are still open and warm. The AMLD hoped that this action would help to control surface evidence of the fire and retard its advance to the north, at least in the short term (Gillette News-Record 9/16/2002). On October 7, 2002, Spectrum submitted its final report to AMLD (Murja 2002).

The Spectrum report describes the state of the fire during the summer of 2002 and details the methods used to seal the cracks. Several sets of fissures, several feet wide and as much as seven feet deep, were on the ridge at the north end of the site; most of these fissures trended east-west. Toward the east end of the ridge, steam vents were developing. Further south and east, wide cracks had opened up in the siltstone layers at the top of the ridge. These were producing elevated temperature, methane, and carbon monoxide readings and depleted oxygen readings. Older cracks, which had nearly filled in, extended down the nose of the ridge. The fissure repair started with the cracks furthest to the north and worked south from the ridge top down the slope. The contractors dug down with a track hoe excavator to create trenches about eight feet deep, then used a wheel loader to fill the base of each trench with two to three feet of dry, finely ground clinker waste which had been trucked in from a crushing operation north of Ranchester. The excavator compacted the fines, then backfilled the trench to the surface with excavated material. For the deeper cracks extending down the nose of the ridge, and for those cracks furthest downhill where it was difficult to get equipment in, a slurry of clinker fines and water was pumped in to seal the fissures. In total, the contractors repaired 23 cracks and vents totaling 2,410 linear feet. Temperatures at the base of the trenches ranged from ambient air temperature to 359 degrees F.

Several remote sensing projects have been conducted, or are pending, in the area. In August 2002, Airborne Data Systems completed a thermal imaging project of the entire Acme area. Results were inconclusive. Attachment 1 of the Murja (2002) report is a thermal scan of the fire area by Airborne Data Systems; the report recommends periodic thermal scans early in the morning and during winter months so problems with solar heating can be negated.

Randy McKinley of the USGS EROS remote sensing data center in Sioux Falls, South Dakota, who visited the fire on May 22 with the BLM staff, obtained a thermal LANDSAT satellite image dated June 24, 2002, of the area extending from Decker, Montana south to the Acme mine area north of Sheridan, Wyoming. The image resolution is coarse, and the area is partially cloud-covered. The sky over the area of the Welch Ranch is clear, however, and there appears to be a slight thermal anomaly in that area. The resolution is not good enough to provide details of the fire. Randy also is analyzing the Airborne Data Systems images to better define thermal anomalies, and is collecting Synthetic Aperture Radar (SAR) interferometry images of the area, to determine if it is possible to detect minute changes in elevation of the fire area over time, due to slumps or landslides as coal is consumed.

Nancy Russell of the BLM National Science and Technology Center in Denver was trying to arrange to have the U.S. Forest Service fly and photograph the Welch Ranch and Acme Mine area, as well as two other sites in Colorado, with their Phoenix thermal infrared sensor during the winter. However, to date the sensor has not been available.

Origin of the Coalbed Fire

The authors think that the Welch Ranch coalbed fire is probably related to an abandoned coal mine fire at the Acme No. 42 mine, immediately south of the Welch Ranch. The mine fire appears to have migrated further north into the area of the current fire since the Acme fire was mapped in 1978 as part of US Geological Survey Professional Paper 1164 (Dunrud and Osterwald 1980). According to this publication, coal fires have been burning in the abandoned Acme mine for many years, as rooms in the underground mine collapsed and allowed air from the surface to enter. Figure 4 of Professional Paper 1164 shows the north edge of the Acme mine fire to extend into the S2 SW of Section 2 as well as the SE SE of Section 3, both within the proposed exchange area of the Welch Ranch. The extent of the fire was based on aerial photos taken in February of 1978 that showed bare ground at a time when deep snow covered the landscape. Notes on an Acme mine map dated August 1940 and received in September 1952 (by whom is undetermined), from the U.S. Office of Surface Mining's Mine Map Repository, tend to support the migration hypothesis. The notes show a fire in a mined area in the E2 NW NW of Section 11, just south of the Welch Ranch and just west of the Tongue River, suggesting that mine collapse near the coal outcrop caused the fire to spread north along the outcrop. Less likely alternatives are that the Welch Ranch fire originated naturally from a coal fire on the outcrop in the SW of Section 2 or resulted from collapse of the old Evans mine in that area. In 1987, the AMLD extinguished and reclaimed coal fires which were advancing upstream in a drainage located in the NE of Sec. 10, T.57N., R.84W., several hundred yards southwest of the current fire (WWC 2001). The Fire Hole Draw project (OSM/AML Project 8-13) covered the area with a mantle of fill in an effort to smother the fire. According to Murja (2002), that fire had broken through to the surface from the underground mine workings during the 1970s.

Figure 4 of our report compares the 1978 fire extent with the mined-out area, the 1940-era fire area, the 1987 fire control project, and the area of current burning in Section 2. The maps indicate that the fire has moved north about 300 feet within the past 24 years. Murja (2002) states that the fire burned as much as 700 feet north during that period. Figure 4 also shows the extent of the Thunder Child forest fire (ArcView shapefiles of forest fire perimeter and limits of Acme Mine courtesy of Julie Gerlach, Aqua Terra Associates, Sheridan, Wyoming).

The Spectrum report (Murja 2002, p. 3) concurs with our view that the Welch fire may be related to the Acme fire. It states, "Available information suggests that this underground coal seam fire is an extension of the Acme Mine Fire. Prior to 1978, the fire in the mine apparently broke out of the mine and began burning northward following the outcrops of the Monarch and Dietz 3 coal seams along bluffs on the west side of the Tongue River. The underground fire has now moved approximately a quarter of a mile north from the mine. If the

fire continues to the north, it will reach the Dietz 3 outcrop on the opposite side of the ridge within 800 feet."

The fire shown on the 1978 map in the SE SE of Section 3 does not appear to have advanced to the north or east. Although there are subsidence cracks on the surface resulting from collapse of the overburden above mined cavities in the underlying Monarch bed (see Photo 17), heat is not escaping from the cracks. The areas in Sections 3 and 10 just west and south of the fence line marking the limits of the quarter quarter section within the Welch Ranch have been reclaimed in previous AMLD projects over the past 20 years (see Photo 18); this appears to have extinguished any fires in the SE SE of Section 3 as well.

Origin of the Forest Fire

Richard Zander and Ed Heffern visited with neighboring landowner Mr. Frank Mommsen at his carburetor shop in Sheridan on the afternoon of May 22, 2002. Mr. Mommsen contends the Thunder Child forest fire of July 2001 started from the coal fire in a draw in the SE SW SW of Section 2 that had been spouting blue smoke all the previous winter. He showed us photos he had taken of this area, including aerial views of the fracture pattern on the bare hillside. He said that a strong wind from the southeast the day of the forest fire caused the coal fire to spread out of control towards the northwest. He said there was no lightning in the area the day the forest fire started, and showed us his results from an Internet lightning detection service, which also did not detect lightning. Mr. Mommsen said he was concerned about BLM acquiring a safety hazard. Jerry Queen and Ed Heffern found the same site as in his photo in the field the following day (Vent #9 on Figure 1, Photos 10 and 11).

Other local residents contend that lightning did occur in the area the day the Thunder Child fire started. One nearby landowner said that lightning struck cottonwood trees in the Tongue River floodplain, and that the fire started on top of a ridge within a few hundred yards of the coal fire. However, apart from the question of whether the coal fire is likely to start additional forest fires, the cause of the forest fire is not a BLM issue, as the fire originated on surface estate that was private at the time.

The Spectrum report states that the cause of the forest fire is not certain. Many of the trees around the site of the underground coal fire were charred. Few trees were present in the central area and eastern edge of the active coal fire, before the forest fire; however, there are many burned trees around the west, south, and north edges of the coal fire.

Hazards

The coal seam fire will probably continue to burn northward and westward until: 1) it runs out of coal, either by hitting an outcrop or prehistoric burn line; 2) the supply of oxygen is cut off because fissures fail to reach the surface; 3) the coal drops below the water table; or 4) the area is fully reclaimed by DEQ (which may be very difficult due to the depth of the fire). Burning could continue for tens to hundreds of years. Potential hazards to the public, if the exchange is consummated and access is allowed, include:

1. Noxious or explosive gases (methane, carbon monoxide, and most likely others that were not evaluated);
2. Depleted levels of oxygen near the fissures;
3. Hot spots on the ground which may mask a fissure or cause burns if someone stepped on them;
4. Unstable ground near fissures which could collapse under weight;
5. Danger of burns or suffocation if someone fell in a fissure; and
6. Risk of the coal fire igniting additional forest and range vegetation.

Toxic and explosive limits for the gases measured are found in a number of publications. Kim and Chaiken (1993, p. 9) stress that carbon monoxide is the most serious hazard in coal fires and cite a threshold limit value of 50 ppm, at which point formation of carboxyhemoglobin will start to produce carbon monoxide poisoning. The NIOSH Pocket Guide to Chemical Hazards (1990, p. 170) gives a 10-hour time-weighted average permissible exposure limit (PEL) of 35 ppm for carbon monoxide in a confined space. EPA has an ambient air standard of 9 ppm for carbon monoxide. Methane of itself is not a toxic gas; however, it is explosive at a concentration in air of between 5% and 15% (50,000 to 150,000 ppm). The main respiratory danger of high levels of methane is that oxygen may be displaced to a level below 19.5%, at which point breathing and pulse rates start to increase (29 CFR 1910, Occupational Safety and Health Standards). Below 10% oxygen, nausea, vomiting, and loss of consciousness occur; below 6% oxygen, convulsions and respiratory failure occur (Kim and Chaiken 1993, p. 10). The data in Table 1 show that carbon monoxide levels are a definite concern and that low oxygen levels may also exist in some areas, especially inside partially confined spaces such as fissures.

Possible methods to control the fire include excavating and removing the coal, digging a trench and filling it with inert material to isolate the coal fire area from unburned coal further back in the hill, injecting liquid nitrogen, fine particles, or foaming grouts into fissures to cut off the oxygen supply, sealing the surface, and/or injecting water (Kim and Chaiken 1993). Water injection may not be effective due to the danger of steam explosions, the fact that the coal beds dip towards the river (which could cause injected water to flow back toward the outcrop instead of toward unburned coal), and the fact that adsorption of water on a dry coal surface (the “heat of wetting” reaction) actually increases the likelihood of combustion. As mentioned earlier, AMLD

did emergency stabilization at the site, using inert material to fill fissures. This may reduce surface expressions of the fire in the short term. The fire is still smoldering underneath the regraded area, as of February 2003. In the long term, it may be difficult and expensive to completely isolate and extinguish the fire, as the fire appears to be fairly extensive and at a depth that would require major excavation to isolate the fire area from unburned coal.

Management Alternatives

We have identified several options for management consideration. They are divided into two sets. One set addresses the land exchange decision process, and the other set addresses possible future BLM management actions if the land exchange is completed in the area of the coal fire. It is important to remember that additional land use planning would need to be completed to address the management of the Welch Ranch if it is acquired. It may be that pieces of several options can be combined to reach a preferred solution. The solution will depend on the level of liability risk that BLM management is willing to assume in exchange for the resources to be acquired, and whether part of the Welch Ranch can or should be deleted from the exchange proposal. The main concern is safety and potential liability for accidents; a recent U.S. District Court decision in Wyoming refused to dismiss a lawsuit filed by a person who was severely burned when he fell into a thermal pool in Yellowstone National Park. The BLM is limited from acquiring private land contaminated with hazardous waste, but coal fires are not defined as hazardous waste. The appraisal staff would need to review and document how potential hazards presented by acquiring lands containing an active coal fire and tonnages of coal involved in the fire would affect the estimated value of the Welch Tract, which could affect the estimate of minable coal reserves that the BLM would offer for exchange. According to the regulations governing exchanges (43 CFR 2200.0-6(c)), the value of the interests being acquired must be equal to the value of the lands or interests being conveyed into private ownership.

The following options deal with the issue of whether or not BLM should acquire the area impacted by the existing coal seam fire:

1. Proceed with the exchange “as is”. Under this option, BLM would acquire the entire Welch Ranch property, including that portion of the Welch Ranch impacted by the existing coal seam fire, and future management would consider the presence of the fire. BLM would assume responsibility as a landowner for any future liability claims related to the fire under this option.

2. Delete the 40-acre parcel that contains the fire from the exchange area. This involves the E2 SW SW and W2 SE SW of Section 2. Figure 6 shows the area covered by Options 2, 3, and 4. Option 2 would eliminate the possibility of BLM incurring liability from the existing coal seam fire on

the hill above the Tongue River. It would not eliminate BLM's future liability for claims from the public if the coal seam fire continues to burn and expand after the remaining Welch Ranch lands are acquired. Additionally, this would not remove liability from BLM if and/or when the fire moves onto Federal surface/coal. This option might also be crafted to delete the mineral estate on this parcel from the exchange and acquire the surface estate only, with the idea of limiting potential liability. Such an option might also eliminate the possibility of BLM incurring liability from the existing coal seam fire, but it has the same limitations as the previous option. If the fire continues to burn, any surface acquired by the BLM could be impacted in the future.

3. Delete the W2 SW SW of Section 2, and the SE SE of Section 3, which has been mined out by the Acme mine, from the exchange area, as well as the 40-acre parcel in Option 2 (a total of 100 acres). The 1980 USGS report showed that the southwest corner of the SE SE of Section 3 was on fire as well. However, a BLM field inspection of this area on September 26, 2002, showed no evidence of active burning. Further collapse in the mined area might allow more air to enter and a fire to ignite or spread. This option also might have the effect of limiting BLM's liability from the existing coal seam fire.

4. Delete a larger area, including a buffer zone, around the mined area and fire. This would prevent the fire from encroaching into a public area for a longer period of time. The option listed here would remove a total of 210 acres, including the 100 acres in Option 3 as well as a buffer zone of 110 acres comprising the following lands: SE NE SW, S2 NW SE, and S2 NE SE of Section 3; and S2 NW SW, S2 NE SW, and E2 SE SW of Section 2. This buffer zone includes small mined out areas as well as outcrops of the Dietz 3 coal seam, past which it will be more difficult for the fire to advance. Management may wish to consider other configurations of the buffer zone, which would eliminate different acreages.

The following options deal with future management of the coal seam fire area if BLM proceeds with the exchange proposal on the entire Welch Ranch without the modifications discussed above:

1. After the Welch Ranch is acquired, exclude the coal seam fire area from any designated recreation area. Fence off the fire area, post warning signs, and monitor advance of the fire with soil gas probes (perhaps setting a north-south row of three-foot long PVC/plastic tubing probes on the hilltop in the direction of fire advance, with a parallel row of gas sorbers, to compare different methods of soil gas analysis).

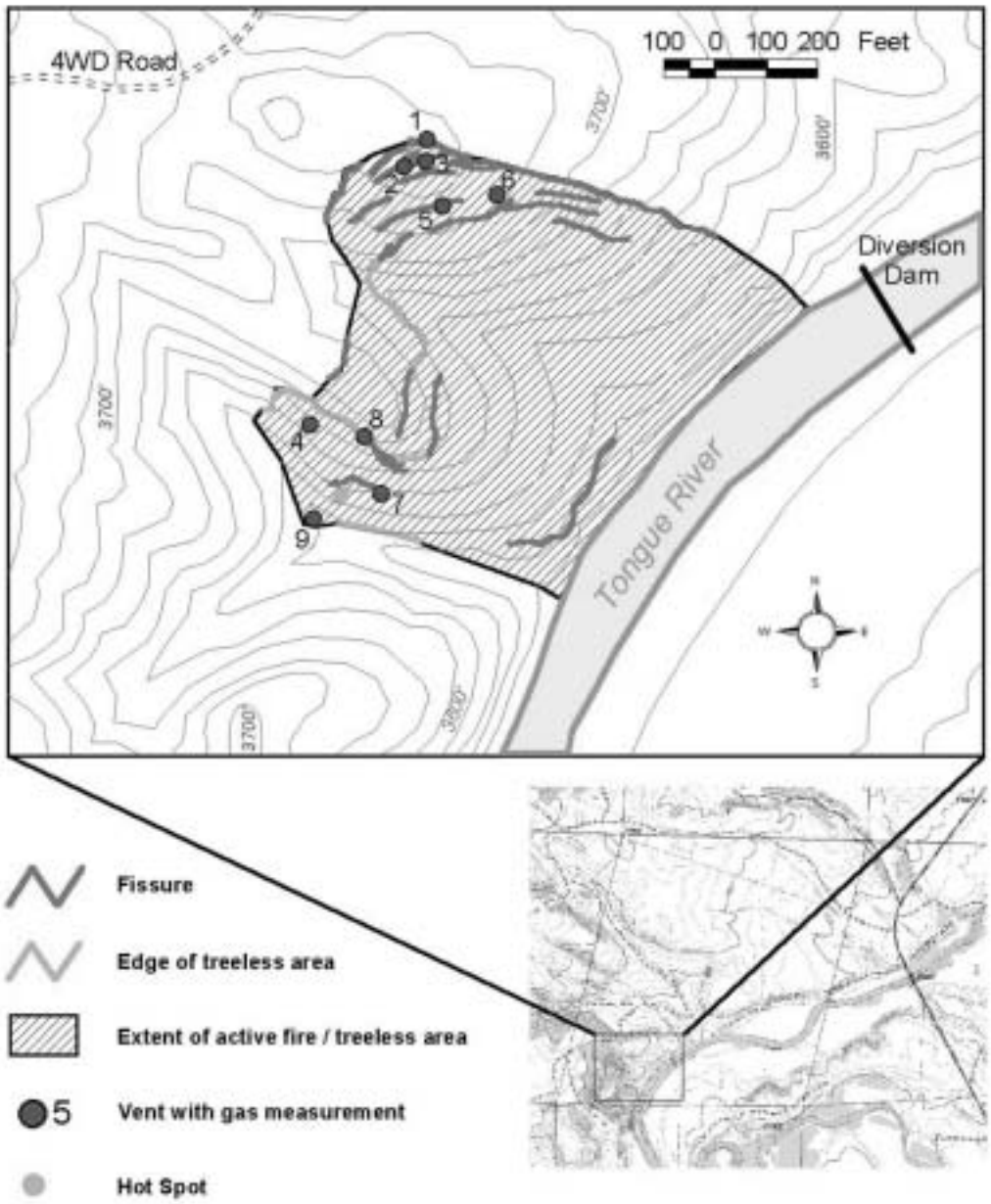
2. Designate the coal fire as a research natural area. Conduct research on burning processes, types and rates of gases produced, and solicit outside research proposals. Allow educational geological tours of the area with

authorized staff. Use remote sensing on a periodic basis to scan for thermal anomalies and escape of gases.

3. There are, or have been, burning coal seams in Theodore Roosevelt National Park and the Little Missouri National Grassland in North Dakota. If the decision is to include the area of the Welch fire in the exchange, it might be useful to visit these sites to see how they are managed and interpreted. We contacted Mr. Noel Poe, superintendent at Theodore Roosevelt National Park, who related that the park had a burning coal vein nature trail; the coal fire there started as a result of a lightning strike in the 1950s and burned until 1972. All coal fires in the park have been extinguished. We also contacted Mr. Curt Glasoe, an engineer with the Little Missouri National Grassland, who has extinguished a number of burning coal veins, especially near oil and gas production sites and pipelines. They have a program to dig out and isolate the burning veins, which ignite due to range fires and lightning. He mentioned a Burning Coal Vein campground on their lands (which the main author of this report has also visited). The Forest Service posted warning signs and fenced off the fire from the campground; they moved the fence every year as the fire advanced. That fire is now extinguished as well. He said there are about 30 active fire areas today in their district.

4. Reclaim the fire in cooperation with the State AMLD. They have already done emergency stabilization of the north part of the active fire. Full reclamation would likely be much more involved, and would have to address the hot areas in the draw along the southwest edge of the fire as well as any resurgence of the north end of the fire. The AMLD may use SMCRA funds to reclaim only fires associated with mining which occurred prior to the SMCRA eligibility date, that present a hazard to public safety and property, and for which there is no responsible party with reclamation obligations for the site. Budgetary constraints may also limit AMLD involvement. The active mine permit may also complicate matters. The fire may be difficult and expensive to extinguish because of the rough topography and the fact that fires are burning in more than one coal bed and as deep as 100 to 200 feet underground. Under this option, additional detailed drilling would be needed to acquire a better understanding of the fire and what coal seams are involved in different areas of the fire.

5. Showcase the coal fire and subsidence areas to the public as an example of natural burning processes and/or coal fire reclamation methods. Develop environmental education signs and exhibits; design pathways to avoid unstable or dangerous areas; and post warning signs where needed. Consider whether P&M could contribute funds or equipment to help monitor future advance of the coal fire, extinguish any future flare-ups of the fire, and/or develop interpretive services.



Coal Seam Fire on Welch Ranch
Sheridan County, Wyoming
SW Sec. 2, T57N, R84W

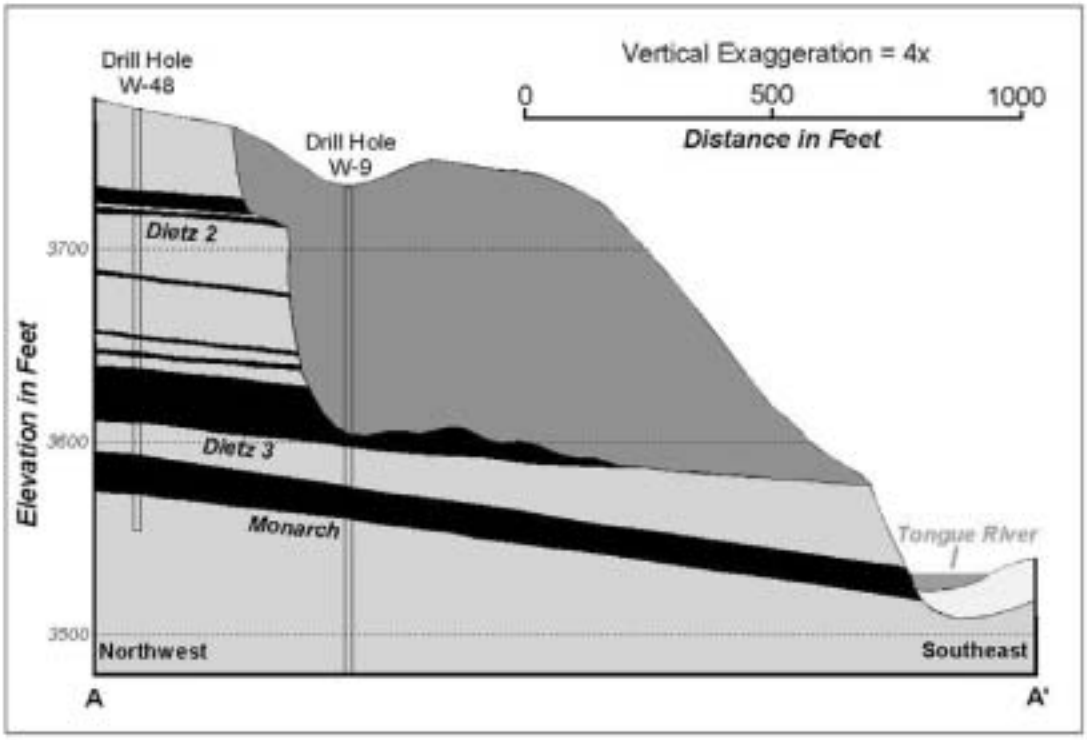
Figure 1

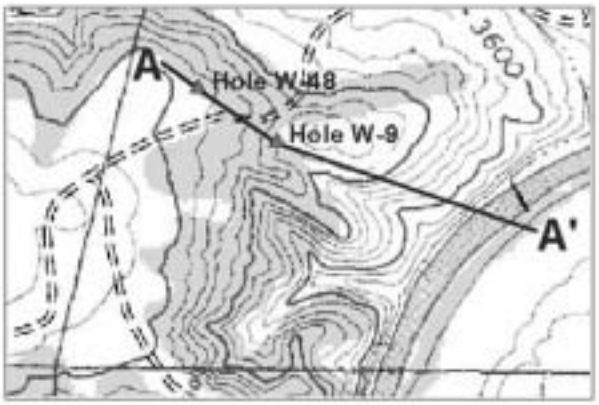
Color Infrared Aerial Photo of Welch Ranch Coal Fire

Enlargement of NAPP image 12641-136, dated September 20, 2001

This enlargement shows features in the vicinity of the Welch Ranch coal fire, two months after the date of the Thunder Child forest fire. The Tongue River flows north across picture; main floodplain is on right (east) side of river. The active Welch Ranch coal fire shows up as the treeless area in the upper center of the picture directly west of the Tongue River. Note the subsidence cracks and fissures, especially along the north rim of the fire area. The diversion dam on the river is at the right edge of the photo. The east-west boundary between Sections 2 and 11 is near lower edge of photo, just north of the island in the river. North is at the top; the picture covers an area of about 0.35 mile by 0.35 mile.

Figure 2

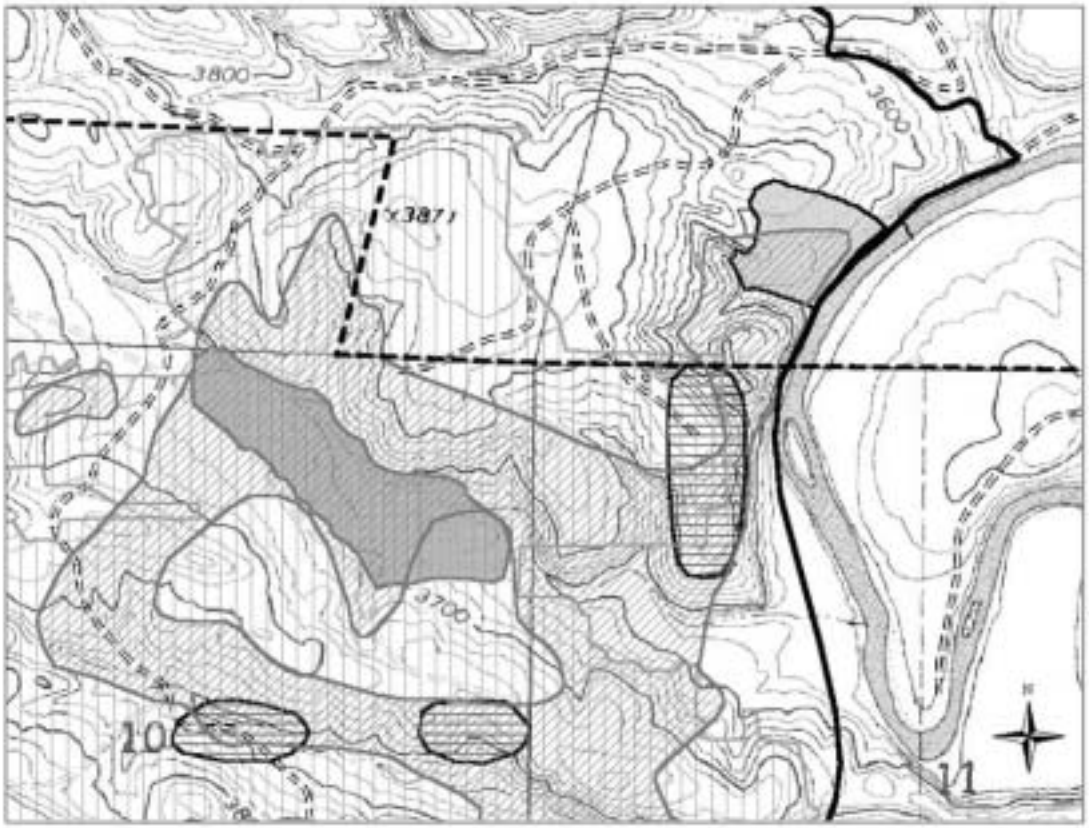




Cross Section Diagram of Coal Beds in Welch Ranch Fire Area

SW Section 2, T57N, R84W, Sheridan County, Wyoming

Figure 3



Current Welch Ranch coal fire / treeless area

Area of 1987 Acme mine fire reclamation project 8-13

Area of Acme mine fire in 1978 (from Dunrud and Osterwald, 1980)

Area of Acme mine fires in 1940's (from OSMRE Mine Map Repository)

Southern edge of Welch Ranch exchange tract (approximate)

East edge of Thunder Child range fire (courtesy of Julie Gerlach, Aqua Terra Associates)

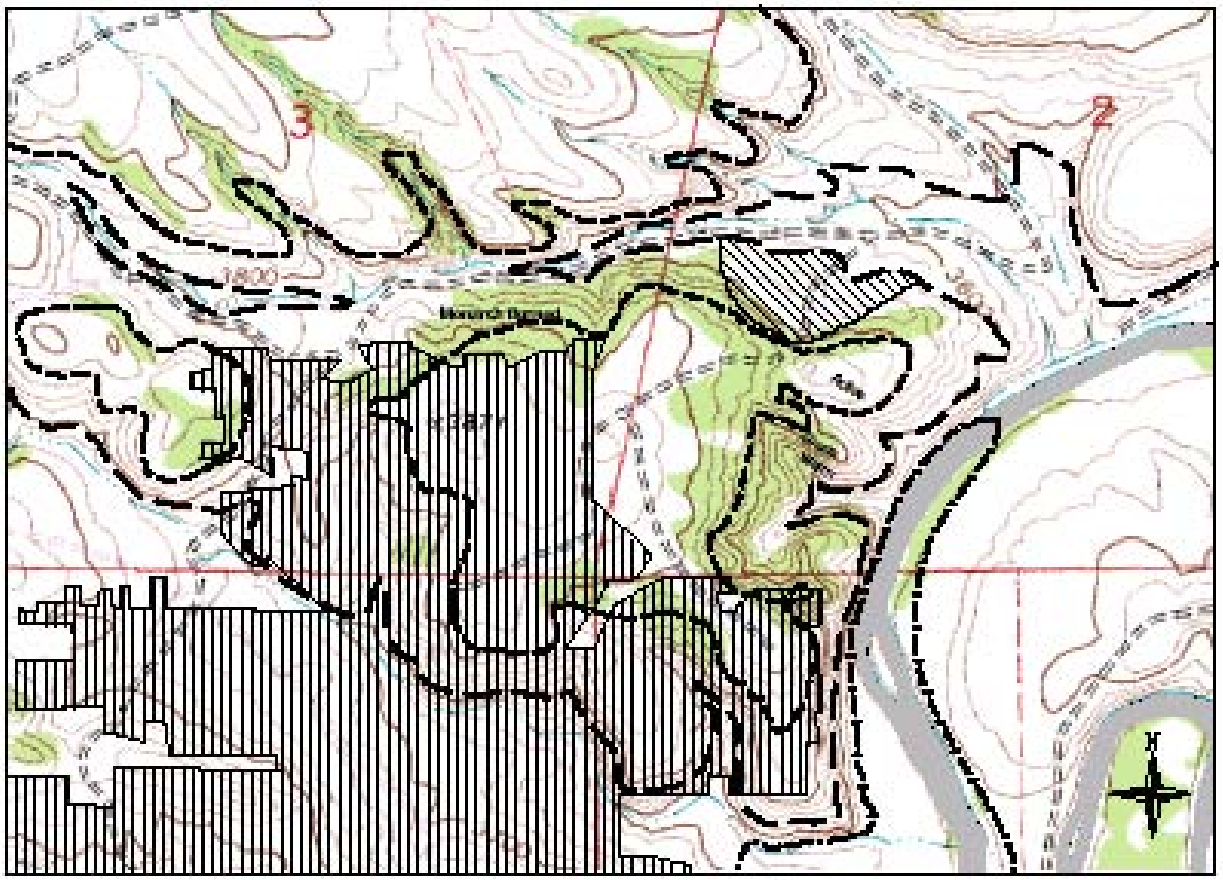
Mined out areas of Acme mine (from OSMRE Mine Map Repository, ArcView shapefile by Julie Gerlach, Aqua Terra Associates)

0.1 0 0.1 0.2 Miles

Mined Areas and Coal Fires - Welch Ranch and Vicinity

Sections 2, 3, 10, and 11, T57N, R84W, Sheridan County, Wyoming

Figure 4



Mined Out Areas of Acme Mine
(from OSMRE Mine Map Repository)

Ancient Burn

0.1 0 0.1 0.2 Miles

Dietz 2 Coal Outcrop

Dietz 3 Coal Outcrop

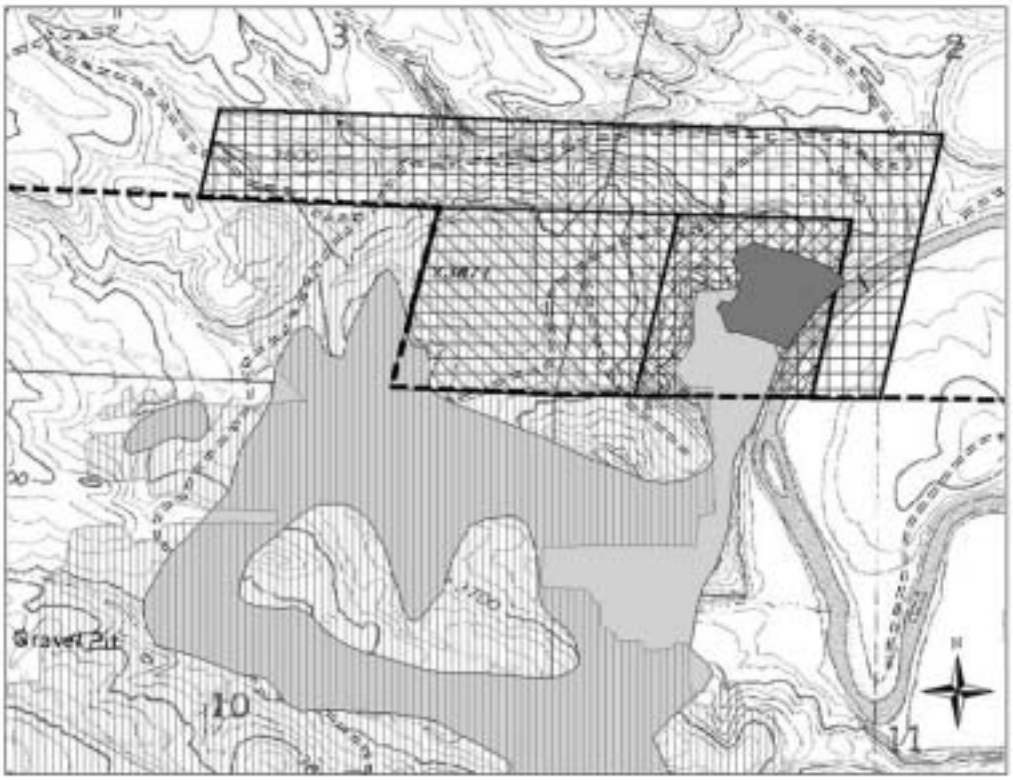
Monarch Coal Outcrop

Notes: Limits of the coal beds from the Welch No. 1 North mine permit application (Sheridan Enterprises 1983), on file with WDEQ/LQD. Entire figure was compiled by Murja (2002).

Limits of Acme Mine and Coal Beds - Welch Ranch and Vicinity

Sections 2, 3, 10, and 11, T57N, R84W, Sheridan County, Wyoming

Figure 5



Option 2 - Delete 40 acres in current fire area

Option 3 - Delete 60 acres in mined area to west of current fire plus 40 areas in Option 2

Option 4 - Delete 110 acres in buffer zone plus 60 acres in Option 3 and 40 acres in Option 2

Current fire/treeless area

Area of Acme coal mine fire in 1978 (from Dunrud and Osterwald, 1980)

Mined-out area of Acme mine

Southern boundary of Welch Ranch exchange tract

Secs. 2, 3, 10, and 11, T57N, R84W

0.1 0 0.1 0.2 Miles

Options for Deleting Acreage from Welch Ranch Tract

Figure 6

Photo 1 - *Jerry Queen of Buffalo FO takes gas readings with ATX 620 monitor from Vent #3.*

Photo 2 -- *Richard Zander of Buffalo FO examines fissure near top of hill.*

Photo 3 - White plastic funnel attached to end of rubber tubing has partially melted after taking gas readings about a foot inside Vent #6. Jerry Queen of Buffalo FO is holding the Industrial Scientific ATX 620 gas meter.

Photo 4 - Treeless, grass-covered hillside marks the area of the active coal fire. Fissures rim the upper edges of the fire. View is to NW from near level of Tongue River.

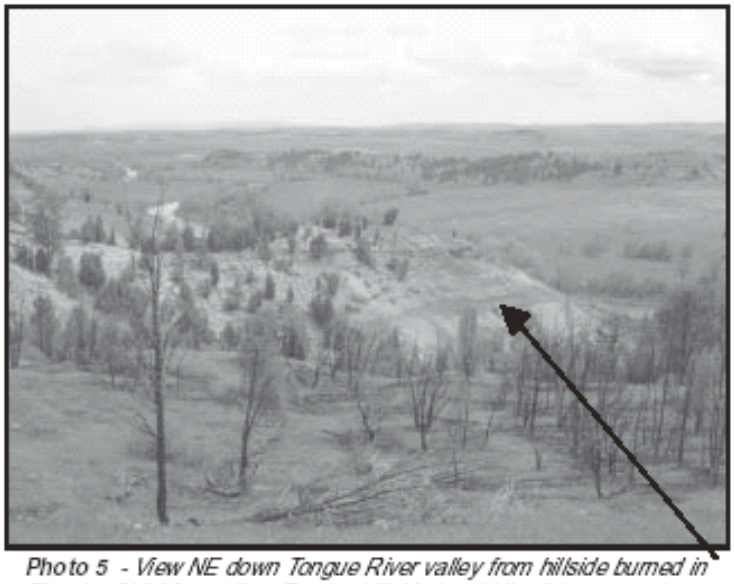


Photo 5 - View NE down Tongue River valley from hillside burned in Thunder Child forest fire. Treeless hillside in middle distance marks area of active coal fire.

Photo 6 - Columnar juniper with discolored branches. Note vapor rising from fissure in ground below tree.

Photo 7 - View to SW from top of hill marking edge of coal fire. Note discolored junipers in foreground as well as columnar junipers along edge of active fire on hill in middle distance. Tongue River valley and area of Acme coal mine are in far distance.

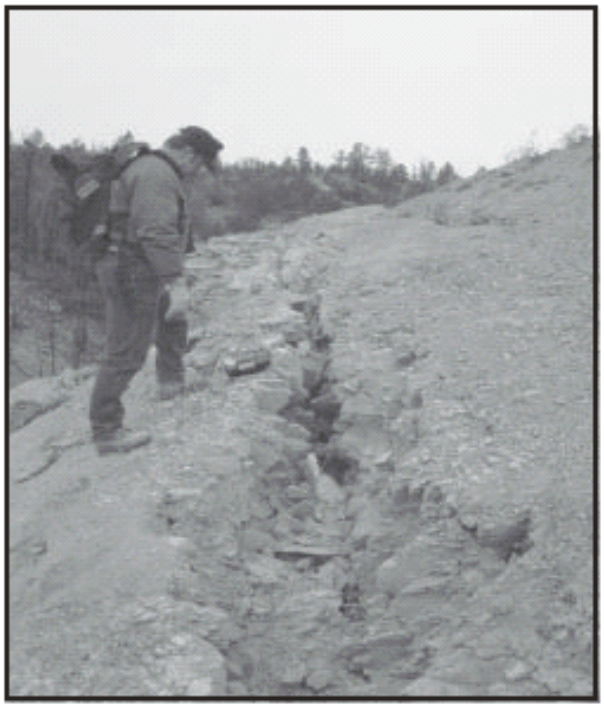


Photo 8 - Fissure on bare hillside. View to NW. Jerry Queen of Buffalo FO takes gas reading from three feet inside Vent #7. Reading showed 132 ppm carbon monoxide, 1000 ppm methane, and 20.4 % oxygen.

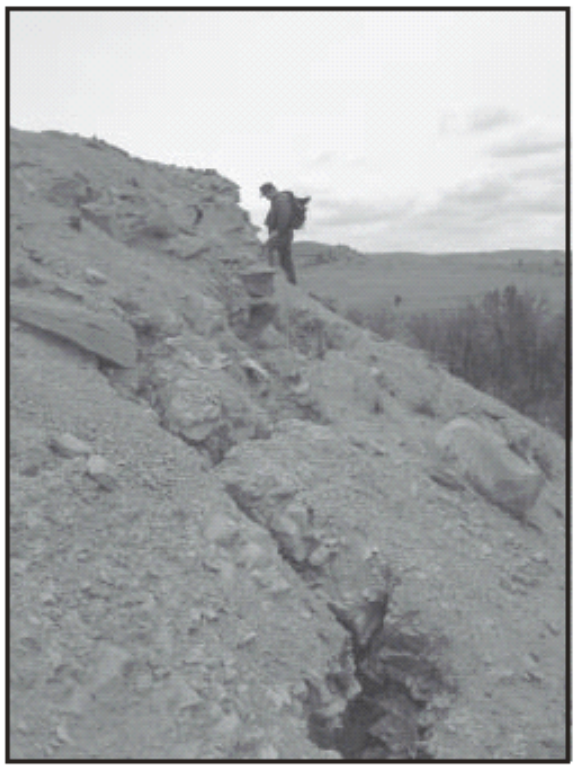


Photo 9 - Another view of fissure at Vent #7. View to NE. Fractures are caused by burning and collapse of underlying Dietz 3 coal bed, leaving a scarp along upper face of slump block.

Photo 10 - Taking gas readings at Vent #9 in draw at edge of active fire. This is where Mr. Mommsen contends the Thunder Child fire originated.

Photo 11 - *View SW from area of whitish bleached hot spot (see Figure 1) to Vent #9 at base of draw. Note burned trees on hillside. Vent is at end of arrow.*

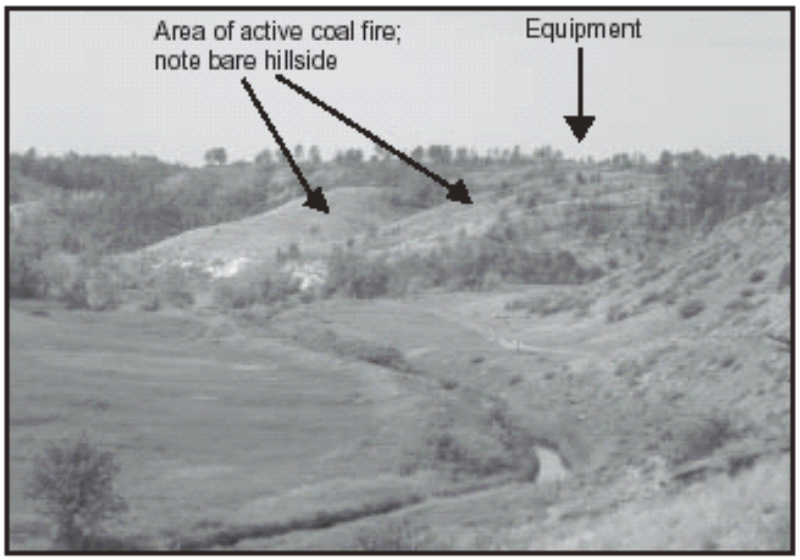


Photo 12 - *View to west of coal fire area along slope and hilltop northwest of Tongue River. Irrigation ditch and access road in foreground. Note reclamation equipment on hilltop.*

Photo 13 - D-8 bulldozer and John Deere 490Z backhoe completing regrading and filling fissures at north end ofcoal fire. Photo taken September 26, 2002.

Photo 14 - Regraded area at north end of coal fire; bare hillside in middle distance is in coal fire area. Tongue River in distance. View southwest toward Acme.

Photo 15 - Fissure with vapor emissions at north end of Welch Ranch coal fire, February 25, 2003.

Photo 16 - Vapor rising from regraded area, February 25, 2003.

Photo 17 - Ed Heffern of BLM Wyoming State Office examines subsidence cracks above old Acme Mine in SE SE of Section 3, T57N, R84W.

Photo 18 - View to west from SE SE Section 3, T57N, R84W. Area in foreground is part of Welch Ranch. Field behind fence is part of reclaimed Acme mine area.

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APPENDIX E

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E-1.0 BIOLOGICAL ASSESSMENT INTRODUCTION

Threatened and endangered species are managed under the authority of the Endangered Species Act (ESA) of 1973 (PL 93-205, as amended). The ESA requires Federal agencies to ensure that all actions which they authorize, fund, or carry out are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of their critical habitat.

This Biological Assessment was prepared to display the possible effects to endangered, threatened, experimental, proposed, or candidate wildlife or vegetative species (terrestrial and aquatic) known to occur, or that may occur within the area influenced by the Proposed Action, which is the Preferred Alternative of the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS). It was prepared in accordance with Section 7 of the ESA.

Biological Assessment objectives are:

1. To comply with the requirements of the ESA that actions of Federal agencies not jeopardize or adversely modify critical habitat of Federally listed species.

2. To provide a process and standard by which to ensure that threatened, endangered, and proposed species receive full consideration in the decision making process.

In addition, the Regional Forester has identified sensitive plant and animal species that are known to be present or are potentially present on the Bridger lands which lie within the Bridger-Teton National Forest (BTNF). The USFS objective for sensitive species is to “develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions” (USFS Manual 2670.22).

The Wyoming BLM has also prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the ESA of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

E-1.1 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

E-1.1.1 The Proposed Action

Pittsburg and Midway Coal Mining Company (P&M) has filed a proposal with BLM and USFS to exchange P&M-owned land and minerals in Lincoln, Carbon, and Sheridan Counties in Wyoming for federally–owned coal in northern

Sheridan County, Wyoming. Figure E-1 is a general location map showing all of the lands that have been proposed for exchange.

Under the Proposed Action, which is the preferred alternative of the BLM and the USFS, the USFS would acquire ownership of the Bridger lands which lie within the BTNF and BLM would acquire the Bridger lands which lie outside of BTNF, the JO Ranch lands, and the Welch lands. P&M would acquire an amount of federal coal underlying the PSO Tract that would be equivalent in value to the properties they are offering for exchange. P&M has indicated that if they acquire the coal, they propose to open a surface coal mine on the PSO Tract. For the purposes of this analysis, it is assumed that P&M would acquire all of the federal coal underlying the PSO Tract and that they would proceed with their proposal to open a surface coal mine. These lands proposed for exchange are described in more detail in subsequent sections of this appendix.

E-1.1.2 Alternatives To The Proposed Action

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

Under the No-Action Alternative the federal coal in the PSO Tract would not be exchanged. Selection of this alternative would not preclude leasing of this federal coal in the future. The Bridger lands, JO Ranch lands, and Welch lands would remain in private ownership. If the exchange is not completed, P&M has indicated that it would consider subdividing these properties to maximize their value and marketing them for sale to the public. The No-Action Alternative is not the preferred alternative of the BLM or the USFS because the lands P&M is offering for exchange have important public resource values.

Other alternatives were considered but not analyzed in detail. These alternatives considered potential methods that BLM and USFS could use to purchase of the lands P&M is offering for exchange. These alternatives, which would have potentially similar impacts to the Preferred Action, were not selected as the preferred alternative of the BLM or the USFS because P&M has indicated that they are not offering the lands proposed for exchange for sale to the BLM or the USFS.

E-1.2 CONSULTATION TO DATE

Informal consultation on this exchange began with the BLM and USFS publication of a Notice of Exchange Proposal in newspapers in the areas where the lands are located in December 2000 and January 2001. On January 25, 2001, the U.S. Fish and Wildlife Service (USFWS) provided preliminary scoping comments related to the unsuitability of several areas included in the PSO Tract for coal leasing and development due to the presence of breeding habitat for the Lewis' woodpecker and a preliminary species list for the PSO Tract

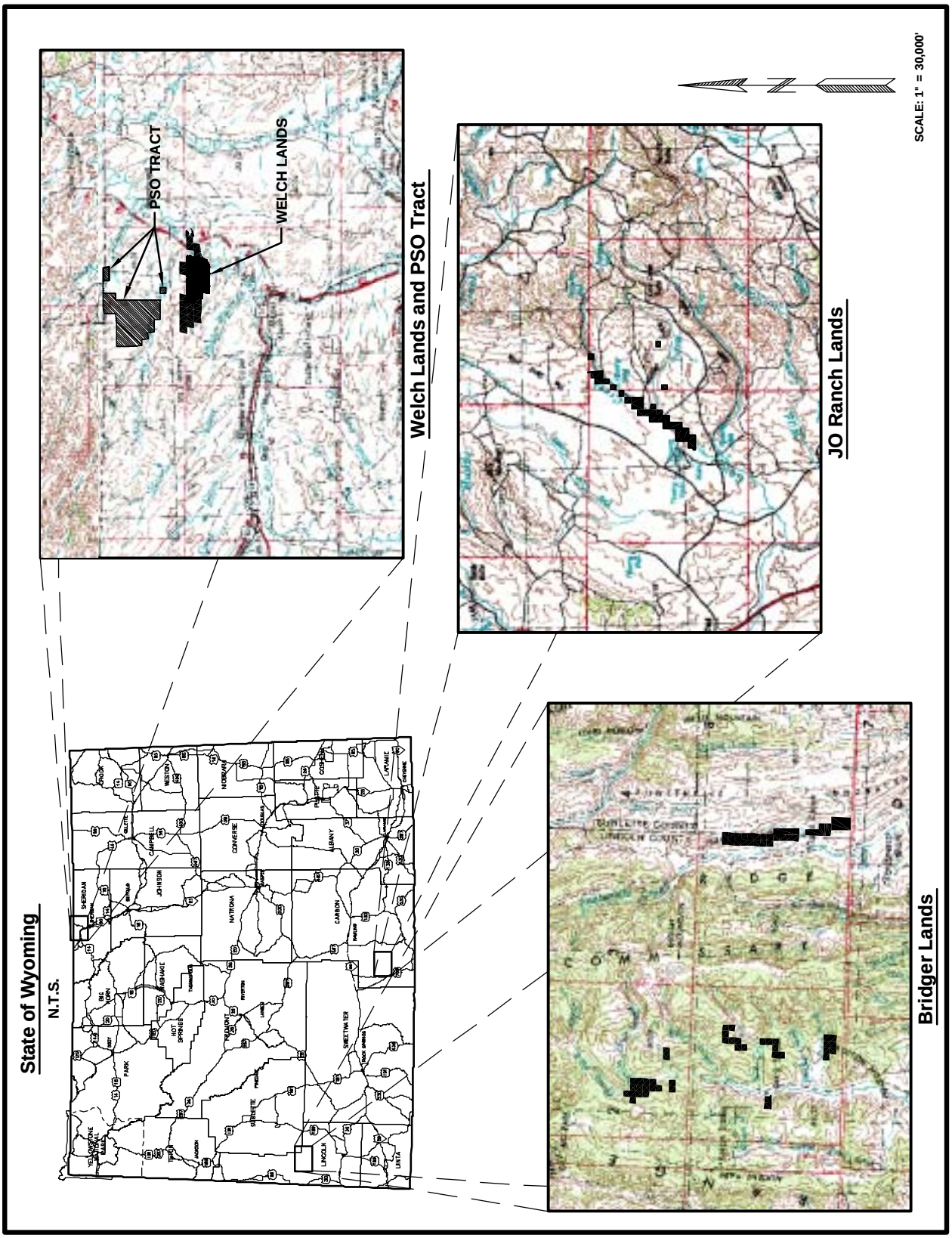


Figure E-1. General Location of Lands Being Offered for Exchange by P&M and the PSO Tract.

(USFWS 2001a). In July 2001, BLM requested USFWS concurrence with a determination that the unsuitability designation is no longer necessary because the Lewis' woodpecker is no longer considered a species of high federal interest in Sheridan County, Wyoming. On August 20, 2001, USFWS responded that they were willing to concur with the change in the unsuitability determination due to the change in status of the Lewis' woodpecker; however, USFWS requested that BLM consider excluding potential nesting areas for the Lewis' woodpecker from the land exchange (USFWS 2001b). BLM approved a maintenance action updating the Buffalo Resource Management Plan (RMP) with respect to the changed status of the Lewis' woodpecker in October 2001. The Draft P&M Land Exchange EIS was distributed in May, 2002. USFWS submitted comments on the Draft P&M Land Exchange EIS on July 19, 2002 (USFWS 2002a). In response to those comments, BLM requested updated species lists for Lincoln, Carbon, and Sheridan Counties, Wyoming. USFWS provided updated lists for these counties in writing on September 11, 2002 (USFWS 2002b) and verbally on April 4, 2003.

E-1.3 BIOLOGY AND HABITAT REQUIREMENTS

The following threatened, endangered, proposed, experimental, and candidate species have been identified by the USFWS in Carbon, Lincoln, and Sheridan Counties, Wyoming as having the potential to be affected by the proposed exchange (USFWS 2002b, verbally updated 4/2003). All of the following species were considered; however, not all species listed here necessarily occur within the proposed exchange areas.

Bald eagle (*Haliaetus leucocephalus*): Threatened (Proposed for delisting).

Canada lynx (*Lynx Canadensis*): Threatened

Ute ladies'-tresses (*Spiranthes diluvialis*): Threatened

Mountain plover (*Charadrius montanus*): Proposed Threatened

Platte River Species: Threatened and Endangered

Black-footed ferret (*Mustela nigripes*): Endangered

Colorado River Fish Species: Endangered

Blowout Penstemon (*Penstemon haydenii*): Endangered

Gray wolf (*canis lupus*): Experimental

Black-tailed prairie dog (*Cynomys ludovicianus*): Candidate

Western boreal toad (*Bufo boreas boreas*): Candidate

Yellow-billed cuckoo (*Coccyzus americanus*): Candidate

Arctic grayling (*Thymallus arcticus*): Candidate

E-1.3.1 Threatened Species

E-1.3.1.1 Bald eagle (*Haliaetus leucocephalus*)

On February 14, 1978, the bald eagle was listed as endangered in all of the coterminous United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as threatened (43 F.R. 6233). The USFWS reclassified the bald eagle from endangered to threatened throughout its range in the lower 48 states on July 12, 1995 (60 F.R. 36000). The bald eagle was proposed for delisting on July 6, 1999 (64 F.R. 36454). Currently, the proposal has not been finalized or withdrawn.

Bald eagles nest primarily in remote areas free of disturbance, containing large trees that are within one mile of water bodies containing reliable fisheries. In Wyoming, this species builds large nests in the crowns of large mature trees such as cottonwoods or pines. Typically, there are alternate nests within or in close proximity to the nest stand. Snags and open-canopied trees near the nest site and foraging areas provide favorable perch sites. Old-growth stands with their structural diversity and open canopies are an important habitat for bald eagles. This species is an uncommon breeding resident in Wyoming utilizing mixed coniferous and mature cottonwood-riparian areas near large lakes or rivers as nesting habitat (Luce et al. 1999).

Food availability is probably the single most important determining factor for bald eagle distribution and abundance (Steenhof 1976). Fish and waterfowl are the primary sources of food. Big game and livestock carrion, as well as larger rodents (e.g., prairie dogs) also can be important dietary components where these resources are available (Ehrlich et al. 1988). Bald eagles are opportunistic foragers. They prefer to forage in areas with the least human disturbance (USFWS 1978, McGarigal et al. 1991).

Bald eagles that have open water or alternate food sources near their nesting territories may stay for the winter; other eagles migrate southward to areas with available prey. During migration and in winter, eagles often concentrate on locally abundant food resources and tend to roost communally. Communal roosts usually are located in stands of mature old growth conifers or cottonwoods. Large, live trees in sheltered areas provide a favorable thermal environment and help minimize the energy stress encountered by wintering eagles. Communal roosting also may facilitate food finding (Steenhof 1976) and pair bonding. Freedom from human disturbance is also important in communal roost site selection (Steenhof et al. 1980, U.S. Bureau of Reclamation 1981, USFWS 1986, Buehler et al. 1991). Continued human disturbance of a night roost may cause eagles to abandon an area (Hansen et

al. 1981, Keister 1981). The proximity of night roosts to the other habitats required by wintering eagles, such as hunting perches and feeding sites, is important (Steenhof et al. 1980). Roosts may be several miles from feeding sites. The absence of a suitable roost may limit the use of otherwise suitable habitat.

E-1.3.1.2 Canada lynx (*Lynx canadensis*)

The Canada lynx was listed as a threatened species in March 2000. Lynx habitat is closely associated with the habitat requirements of snowshoe hare (*Lepus americanus*), its primary prey. Hares prefer dense mixed conifer stands for cover, with meadows and other openings for feeding. Red squirrels, ground squirrels, and grouse can be alternate prey items. Mature forests with downed logs and windfalls provide denning and security cover for lynx. Lynx are found in high elevation areas with deep snows where lynx have a competitive advantage over other predators. It appears that historic tie hack areas are currently providing high quality lynx habitat within the Wyoming Range. These old tie hack areas contain multiple storied, mixed conifer stands with a dense understory of regenerating spruce and fir.

E-1.3.1.3 Platte River species: Bald eagle (*Haliaeetus leucocephalus*), Piping plover (*Charadrius melodus*), and Western prairie fringed orchid (*Platanthera praeclara*)

These species are associated with the Platte River drainage downstream in Nebraska. The different species require a variety of habitats ranging from the actual river for the fish and water birds to riparian and wetlands habitats for the waterbirds and plants. The orchid is indigenous to this river system, while the bird species range from migrants (plover) using the area during migration or for feeding and breeding, to year-long residents (bald eagle), breeding and wintering along the river. Any depletions of water in the Platte River drainage system in Wyoming could affect these species downstream (USFWS 2002b).

E-1.3.1.4 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses was listed as threatened on January 17, 1992 due to a variety of factors, including habitat loss and modification, and hydrological modifications of existing and potential habitat areas. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. It was then discovered in Idaho in September 1996. It is currently known from western Nebraska, southeastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central Idaho, southwestern Montana, and central Washington.

Ute ladies'-tresses is a perennial herb with erect, glandular-pubescent stems 12 to 50 centimeters tall arising from tuberous-thickened roots. This species flowers from late July to September. Plants probably do not flower every year

and may remain dormant below ground during drought years. The total known population of this species is approximately 25,000 to 30,000 individuals. Occurrences range in size from one plant to a few hundred individuals.

Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering springs, lakes, rivers, or perennial streams at elevations between 1,780 and 6,800 feet (ft) in elevation (Fertig and Beauvais 1999). Suitable soils vary from sandy or coarse cobbley alluvium to calcareous, histic or fine-textured clays and loams. Populations have been documented from alkaline sedge meadows, riverine floodplains, flooded alkaline meadows adjacent to ponderosa pine, Douglas-fir woodlands, sagebrush steppe, and streamside floodplains. Some occurrences are also found on agricultural lands managed for winter or early season grazing or hay production. Known sites often have low vegetative cover and may be subjected to periodic disturbances such as flooding or grazing. Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances, such as grazing, that are common to grassland riparian habitats (USFWS 1995). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid establishes in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995). The species occurs primarily in areas where the vegetation is relatively open and not overly dense, overgrown, or overgrazed. Ute ladies'-tresses orchid is commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, and arrowgrass.

This species is known from four occurrences in Wyoming, within Converse, Goshen, Laramie, and Niobrara Counties, all discovered between 1993-1997 (Fertig and Beauvais 1999). One of these occurrences is recorded from northwestern Converse County, within the Antelope Creek watershed.

E-1.3.2 Endangered Species

E-1.3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret is a federally-listed endangered species. The black-footed ferret historically occurred throughout Texas, Oklahoma, New Mexico, Arizona, Utah, Kansas, North and South Dakota, Montana, Wyoming, Nebraska, and Colorado. The black-footed ferret, a nocturnally active mammal, is closely associated with prairie dogs, depending almost entirely upon the prairie dog for its survival. The decline in ferret populations has been

attributed to the reduction in the extensive prairie dog colonies that historically existed in the western United States. Ferrets may occur within colonies of white-tailed or black-tailed prairie dogs. The USFWS has determined that, at a minimum, potential habitat for the black-footed ferret must include a single white-tailed prairie dog colony of greater than 200 acres, or a complex of smaller colonies within a 4.3 mile (7 km) radius circle totaling 200 acres (USFWS 1989). Minimum colony size for black-tailed prairie dog is 80 acres (USFWS 1989). The last known wild population was discovered in Meeteetse, Wyoming. Individuals from this population were captured and raised in protective captive breeding facilities in an effort to prevent the species' extinction (Clark and Stromberg 1987).

Recent survey efforts in the Shirley Basin have identified a population at this former re-introduction site. This is the only known population in Wyoming.

E-1.3.2.2 Colorado River fish species: Bonytail chub (*Gila elegans*), Colorado pikeminnow/squawfish (*Ptychocheilus lucius*), Humpback chub (*Gila cypha*), and Razorback sucker (*Xyrauchen texanus*)

These four species are native to the upper Colorado River Basin within mainstem river channels. Although once abundant throughout both the Green and Colorado River systems, all four species are now limited to reaches of river that are either relatively undisturbed or controlled to provide appropriate flows. Reservoir impoundments and water diversions are the main threats to these species. It is likely that the closest occurrence of these species is in the lower Little Snake River drainage of Colorado (Tyus and Karp 1989). Federal agency actions resulting in water depletions to the Colorado River system may affect these four endangered fish species downstream in the Colorado River systems. The USFWS has determined that where projects may lead to depletions of water to the Colorado River system, these species may be affected and formal consultation is required. In general, depletions include evaporative losses and/or consumptive use of surface or groundwater within the affected basin, often characterized as diversions less return flows. Project elements that could be associated with depletions include, but are not limited to ponds, lakes, reservoirs, pipelines, wells, diversion structures, and water treatment facilities. Any actions that may result in water depletions should be identified and include an estimate of the amount and timing of average annual water depletion (both existing and new), and describe methods of arriving at such estimates.

E-1.3.2.3 Blowout penstemon (*Penstemon haydenii*)

The blowout penstemon is a federally listed endangered species that is known to occur in south-central Wyoming and western Nebraska. In Wyoming this species has been recorded in Carbon County. This species is only found in blowout-like sand dunes in early successional stages where vegetation is very sparse. In Wyoming, blowout penstemon is found on steep, northwest facing

slopes of active sand dunes with less than five percent vegetative cover. Flowering in Wyoming generally occurs from late June to early July and seeds are released from late August to September. Blowout penstemon has declined due to stabilization of sand dunes through conservation and other management practices. Once a sand dune is stabilized, other plants invade and out-compete this penstemon. To a lesser extent, this species may be impacted from livestock grazing, prolonged drought and off-road vehicles (Fertig 2002).

E-1.3.2.4 Platte River species: Whooping crane (*Grus americana*), Interior least tern (*Sterna antillarum*), Pallid sturgeon (*Scaphirhynchus albus*), and Eskimo curlew (*Numenius borealis*)

These species are associated with the Platte River drainage downstream in Nebraska. The different species require a variety of habitats ranging from the actual river for the fish and water birds to riparian and wetlands habitats for the waterbirds and plants. The sturgeon are indigenous to this river system, while the bird species (crane, tern, curlew) are migrants, using the area during migration or for feeding and breeding along the river. Any depletions of water in the Platte River drainage system in Wyoming could affect these species downstream (USFWS 2002b).

E-1.3.3 Proposed Species

E-1.3.3.1 Mountain plover (*Charadrius montanus*)

The mountain plover is proposed for federal listing (USFWS 1999a). The USFWS has 60 days to seek input from three species experts, the public, scientific community, and Federal and State agencies. The USFWS published a 60-day extension to the comment period on April 19, 1999 (USFWS 1999b). In October 2001, the USFWS designated the mountain plover as a proposed threatened species (USFWS 2001c).

The mountain plover is a migratory species of the shortgrass prairie and shrub-steppe eco-regions of the arid West. This species utilizes high, dry, shortgrass prairie with vegetation typically shorter than four inches tall. Within this habitat, areas of blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) are most often utilized, as well as areas of mixed-grass associations dominated by needle-and-thread (*Stipa comata*) and blue grama (Dinsmore 1983).

Mountain plovers often use black-tailed prairie dog towns for breeding, nesting, and feeding. Not all prairie dog towns offer suitable habitat for mountain plover, mostly due to topographic incompatibility. There are habitats other than prairie dog towns that provide nesting, feeding, and breeding habitat for mountain plover.

The nest of the mountain plover consists of a small scrape on flat ground in open areas. Most nests are placed on slopes of less than five degrees in areas where vegetation is less than three inches tall in April. More than half of identified nests occurred within 12 inches of old cow manure piles and almost twenty percent were found against old manure piles in similar habitats in Colorado. Nests in similar habitats in Montana (Dinsmore 1983) and other areas (Ehrlich et al. 1988) were nearly always associated with the heavily grazed shortgrass vegetation of prairie dog colonies.

Mountain plovers arrive on their breeding grounds in late March with egg-laying beginning in late April. Breeding plovers show close site fidelity, often returning to the same territory in subsequent years. Clutches are hatched by late June and chicks fledge by late July. The fall migration begins in late August and most birds are gone from the breeding grounds by late September.

E-1.3.4 Experimental Species

E-1.3.4.1 Gray wolf (*Canis lupus*)

In 1973, the northern Rocky Mountain wolf subspecies (then known as *Canis lupus irremotus*) was listed as endangered, and in 1978 the legal status of the gray wolf south of Canada was listed as endangered, while the Minnesota wolf population was listed as threatened. Then in 1994, the USFWS made the decision to reintroduce the gray wolf into Yellowstone National Park and classify this population as nonessential experimental wolves according to section 10(j) of the ESA as amended (USFWS 1994). All wolves occurring in the state of Wyoming are classified as nonessential experimental.

Although gray wolves are native to BTNF, human persecution resulted in the extirpation of wolves by the late 1920s. Unverified reports of wolves or wolf tracks have been received since the late 1960s within Grand Teton National Park (Grand Teton National Park wildlife observation files) and in and around BTNF (BTNF wildlife files). Human caused mortality is still a major factor limiting wolf numbers.

Reintroduction efforts in Yellowstone began in the winter of 1994-1995, and a total of 31 wolves were released over two years. The Recovery Plan for wolves in the Rocky Mountain area established a biological goal of a minimum of 10 breeding pairs of wolves in each of the three recovery areas (northwestern Montana, central Idaho, and Greater Yellowstone Area) for three successive years. After the wolf population reaches recovery levels and, as required by the ESA, the USFWS is assured that state management practices would adequately conserve the wolf population, the USFWS will propose that wolves be removed from the protection of the ESA. The delisting process includes extensive public involvement and the opportunity for comment which could begin in early 2003 (USFWS 2001d). Wolf recovery has progressed faster than predicted, and the USFWS announced that the three-year countdown to wolf recovery started in

2000 (USFWS 2001d). In 1999, at least 118 wolves were known to be present in the Greater Yellowstone Wolf Recovery Area, in 11 established packs averaging 9.2 wolves per pack. As of December 31, 2001, about 216 wolves inhabited the Yellowstone Ecosystem in about 24 packs or groups, most of which inhabited territories in Yellowstone or Grand Teton National Parks. The rough draft monitoring tally for 2002 was as follows:

- northwestern Montana – 116 wolves in 13 breeding pairs;
- central Idaho – 285 wolves in 10 breeding pairs, and;
- Greater Yellowstone Area – 280 wolves in 18 breeding pairs.

That is an estimate of 681 wolves in 41 breeding pairs, meaning the three-year count down was achieved on December 31, 2002 (USFWS 2003).

The USFWS also determined "when six or more breeding pairs are established in an experimental population area, no land-use restrictions may be employed outside of national parks or national wildlife refuges, unless wolf populations fail to maintain positive growth rates toward population recovery levels for two consecutive years" (USFWS 1994).

E-1.3.5 Candidate Species

E-1.3.5.1 Black-tailed prairie dog (*Cynomys ludovicianus*)

The black-tailed prairie dog was added to the list of candidate species for federal listing on February 4, 2000 (USFWS 2000a). At that time, the USFWS concluded that listing the black-tailed prairie dog was warranted but precluded by other higher priority actions to amend the lists of threatened and endangered (T&E) species. No specific date for proposal for listing was given, but the USFWS committed to reviewing the status of the species one year after publication of the above-mentioned notice (i.e., on February 4, 2001) (USFWS 2000b). As of June 2002, the USFWS was listing the black-tailed prairie dog as a candidate (USFWS 2002c).

The black-tailed prairie dog is a highly social, diurnally active, burrowing mammal. Aggregations of individual burrows, known as colonies, form the basic unit of prairie dog populations. Found throughout the Great Plains in shortgrass and mixed-grass prairie areas (Fitzgerald et al. 1994), the black-tailed prairie dog has declined in population numbers and extent of colonies in recent years due to habitat destruction or disturbance and pest control activities. In Wyoming, this species is primarily found in isolated populations in the eastern half of the state (Clark and Stromberg 1987). Many other wildlife species, such as the black-footed ferret, swift fox, mountain plover, ferruginous hawk, and burrowing owl are dependent on the black-tailed prairie dog for some portion of their life cycle (USFWS 2000b).

The species is considered a common resident, utilizing shortgrass and mid-grass habitats in eastern Wyoming (Luce et al. 1999).

E-1.3.5.2 Western boreal toad (*Bufo boreas boreas*)

The western boreal toad was listed as a candidate species only in the "Southern Rocky Mountain Distinct Population Segment (DPS)" and has retained this listing for over eight years. The Southern Rocky Mountain DPS covers southeastern Wyoming, Colorado, and northern New Mexico. Dry, non-forested basins and valleys geographically separate this southern population from the northern population. The northern population, which does not bear the candidate species listing, is found in western and northwestern Wyoming and high elevations in states to the north and west.

This toad, which is a 3- to 4-inch long amphibian, is generally found in wet habitats in the foothills, montane, and subalpine areas including subalpine meadows, aspen and spruce-fir forests, and all riparian habitat types from 8,000-11,000 ft in elevation. Boreal toads have also been found in kettle ponds, beaver ponds, and old oxbow lakes with still, shallow water and a mud or silt bottom. Boreal toads eat a variety of insects. Breeding usually occurs from mid-May to mid-July depending on elevation and weather. Eggs hatch from late June to late September. Breeding and egg laying occur in shallow areas of ponds and lakes. Studies indicate that males do not breed until they are four years old and females do not breed until six years of age. Mortality is very high due to predation and infection by chytrid fungus (Keinath and Bennet 2000, Baxter and Stone 1985).

E-1.3.5.3 Yellow-billed cuckoo (*Coccyzus americanus*)

The "Western Yellow-billed Cuckoo DPS" was listed as a candidate species in 2001. This DPS is found west of the continental divide. The candidate listing does not include the yellow-billed cuckoo within its range east of the continental divide. Therefore in Wyoming, the range of the candidate listing encompasses the western portion of the state.

The western yellow-billed cuckoo is a medium-sized bird of about 12 inches in length and weighing about two ounces. This species breeds in large blocks of riparian habitats, primarily woodlands with cottonwoods and willows. Dense understory appears to be important for nest site selection, while cottonwoods provide important foraging habitat. Nesting usually peaks from mid-June through August and may be triggered by an abundance of cicadas, katydids, caterpillars, or other large prey, which form the bulk of the species' diet. The decline of the western yellow-billed cuckoo is generally attributed to loss of habitat (USFWS 2001e).

E-1.3.5.4 Arctic grayling (*Thymallus arcticus*)

The Arctic grayling has been classified as a candidate species since prior to 1982 only for the "Fluvial Arctic Grayling, Upper Missouri River DPS" where this species is indigenous. This generally covers the extreme northwestern portion of Wyoming and portions of southwestern Montana. Populations of Arctic grayling that were introduced into other areas of Wyoming are not included in this candidate species listing. Therefore, although Arctic grayling are not expected to occur in any of the areas addressed in this EIS, any Arctic grayling that may be found on these lands would not be included in the candidate species classification.

In Wyoming, the Arctic grayling is indigenous to the Madison River drainage in Yellowstone National Park. This species has also been introduced into a number of high plains habitats in other drainages in the state and has established viable populations in some of those areas. The Arctic grayling is a cold water salmonoid occurring in the northern regions of North America. Grayling generally prefer the clear waters of large rivers, creeks, and mountain lakes. This fish spawns in the spring, normally migrating into streams to spawn on gravel bars. Arctic grayling primarily feed on insects, with a high percentage of terrestrial insects, but diets sometimes include small fish (Baxter and Stone 1995).

E-1.4 SUMMARY OF DETERMINATIONS

Table E-1.1 summarizes the determinations for the federally listed threatened, endangered, proposed, experimental, and candidate species in the Bridger lands, JO Ranch lands, Welch lands, and PSO Tract if the exchange is completed.

E-1.5 BRIDGER LANDS

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

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

<u>Lands to be administered by USFS</u>:
T.26N., R.116W., 6th P.M., Wyoming
Tracts 39, 41, and 42;

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

Table E-1.1. Effects Evaluation of Federal Threatened, Endangered, Proposed, Experimental, and Candidate Species in the Areas of the Bridger Lands, JO Ranch Lands, Welch Lands, and PSO Tract.

		Potential Effects by Area[1]			
Status	**Species Common Name**	**BL**	**JO**	**WL**	**PSO**
Threatened:	Bald eagle	May affect[2]	May affect[2]	May affect[2]	May affect[3]
	Canada lynx	May affect[2]	No effect[2]	May effect[2]	May effect[3]
	Ute ladies'-tresses	No effect	May affect[2]	May effect[2]	May effect[3]
Endangered:	Black-footed ferret	No effect	May affect[2]	May affect[2]	May affect[3]
	Bonytail chub	May affect[2]	May affect[2]	No effect[4]	No effect[4]
	Colorado pikeminnow	May affect[2]	May affect[2]	No effect[4]	No effect[4]
	Humpback chub	May affect[2]	May affect[2]	No effect[4]	No effect[4]
	Razorback sucker	May affect[2]	May affect[2]	No effect[4]	No effect[4]
	Blowout penstemon	No effect[4]	No effect	No effect[4]	No effect[4]
	Platte River Species	No effect[4]	No effect	No effect[4]	No effect[4]
Proposed:	Mountain plover	No effect	May affect[5]	May affect[5]	May affect[6]
Experimental:	Gray wolf	May affect[5]	No effect[4]	No effect[4]	No effect[4]
Candidate:	Black-tailed prairie dog	No effect	No effect	May affect[2]	Would affect[7]
	Western boreal toad	No effect[8]	No effect[8]	No effect[8]	No effect[8]
	Yellow-billed cuckoo	May affect[2]	May affect[2]	No effect[8]	No effect[8]
	Arctic grayling	No effect[8]	No effect[8]	No effect[8]	No effect[8]

[1] Potential Effects by Area: BL = Bridger Lands; JO = JO Ranch Lands; WL = Welch Lands; PSO = PSO Tract.
[2] Not likely to adversely affect individuals or populations. Any effects are likely to be beneficial.
[3] Not likely to adversely affect individuals or populations.
[4] USFWS does not list this species for this area.
[5] Not likely to jeopardize continued existence of proposed or experimental individuals or populations. Any effects are likely to be beneficial.
[6] Not likely to jeopardize continued existence of proposed individual or populations.
[7] Mining disturbance would have direct and indirect effects on individuals and populations
[8] Not within the range of the Distinct Population Segment (DSP) provided Candidate Status.

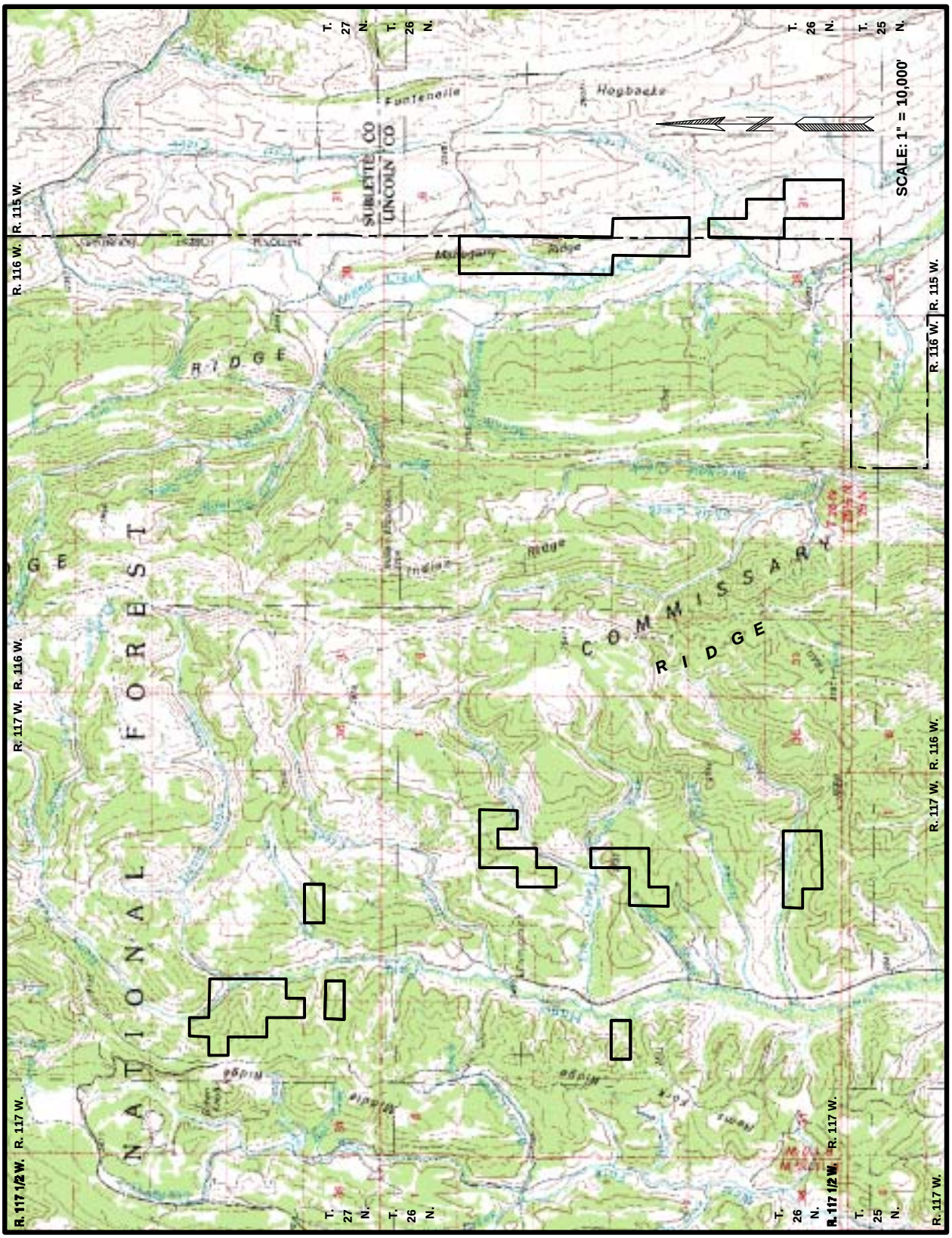


Figure E-2. Bridger Lands Location Map.

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

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

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

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

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

The Bridger lands are surrounded by public lands and minerals administered by the BLM and the USFS. Under the Proposed Action, if these lands become public lands, the acquired surface and mineral estates would be managed like the surrounding public lands in accordance with the BLM *Pinedale Resource Management Plan* and the USFS *BTNF Land and Resource Management Plan*. USFS also provided general resource information for the Bridger parcels that lie within the BTNF, which is included as Appendix F of this EIS.

Within the analysis area, there is no "critical" habitat designated by USFWS for threatened or endangered species. Table E-1.2 is a list of threatened, endangered, proposed, experimental, and candidate species known or suspected to occur in the area of Bridger lands (Lincoln County, Wyoming) that was provided to the BLM by the USFWS in September 2002 (USFWS 2002b) and verbally updated in April 2003.

E-1.5.1 Threatened Species

E-1.5.1.1 Bald eagle (*Haliaetus leucocephalus*)

Existing Environment: There is bald eagle habitat available in the analysis area, however the majority of the Bridger parcels are not typically considered bald eagle habitat (lodgepole pine, aspen, sagebrush meadow). Eagles forage on gut piles and game parts leftover from hunters in the fall regardless of the habitat type where they occur.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, bald eagles or their habitat. Any effects are likely to be

Table E-1.2. Occurrence of Threatened, Endangered, Proposed, Experimental, and Candidate Species in the Area of the Bridger Lands.

Status	Name	Occurrence*
Threatened:	Bald eagle (*Haliaetus leucocephalus*)	K
	Canada lynx (*Lynx canadensis*)	K
	Ute ladies'-tresses (*Sprianthes diluvialis)*	NS
Endangered:	Black-footed ferret (*Mustela nigripes*)	NS
	Bonytail chub (*Gila elegans*)	NS
	Colorado pikeminnow (*Ptychocheilus lucius*)	NS
	Humpback chub (*Gila cypha*)	NS
	Razorback sucker (*Xyrauchen texanus*)	NS
Proposed:	Mountain plover (*Charadrius montanus*)	NS
Experimental:	Gray wolf (*Canis lupus*)	S
Candidate:	Black-tailed prairie dog (*Cynomys ludovicianus*)	NS
	Western boreal toad (*Bufo boreas boreas*)	NS
	Yellow-billed cuckoo (*Coccyzus americanus*)	S
	Arctic grayling (*Thymallus arcticus*)	NS

*Occurrence Key: K = known, S = suspected in area of influence of Proposed Action, NS = not suspected in area of influence of Proposed Action

beneficial. If the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure E-2, which would extend USFS and BLM management onto the Bridger parcels. This would facilitate habitat management and protection of T&E species on the tracts by the USFS and BLM. The lands and minerals would not be available for subdivision and/or private development that could potentially adversely affect bald eagles in this area in the future.

E-1.5.1.2 Canada lynx (*Lynx canadensis*)

Existing Environment: It appears that historic tie hack areas are currently providing high quality lynx habitat within the Wyoming Range. These old tie hack areas contain multiple storied, mixed conifer stands with a dense understory of regenerating spruce and fir. There was extensive tie-hacking within the Hams Fork drainage between 1881 and 1937. It appears wildfire effects were widespread because current stand structure tends to be single canopy and with limited ground vegetation or coarse woody debris. Also, mesic spruce/subalpine fir stands, which tend to produce complex structure favorable for snowshoe hares and lynx, appear to be smaller and more discontinuous than in areas further north in the Wyoming Range. There is a light scatter of historic lynx locations across the USFS Kemmerer District and recent radio telemetry locations have been recorded in the Hams Fork drainage. A winter track survey was conducted winter 2000/2001 on portions of the Kemmerer District although not in the project area. A resident population is present to the north on the Big Piney Ranger District. Although no lynx activity has been documented within the Bridger parcels, lynx are likely to travel through the project area.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, Canada lynx and their habitat. Any effects are likely to be beneficial. If the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure E-2, which would extend USFS and BLM management onto the Bridger parcels. This would facilitate habitat management and protection of T&E species on the tracts by the USFS and BLM. The lands and minerals would not be available for subdivision and private development that could potentially adversely affect Canada lynx if they do establish a presence in this area in the future.

E-1.5.1.3 Ute ladies'-tresses (*Spiranthes diluvialis*)

Existing Environment: Ute ladies'-tresses has not been located and is not expected to occur as the analysis area is above the expected elevation range of this plant. However, no survey work has occurred.

Effects of Proposed Project: The Proposed Action will have no effect on Ute ladies'-tresses. The elevation of the Bridger lands is above the expected range of the orchid.

E-1.5.2 Endangered Species

E-1.5.2.1 Black-footed ferret (*Mustela nigripes*)

Existing Environment: Black-footed ferrets are potential residents in prairie dog (*Cynomys* sp.) colonies. Based on USFS observations, there are no prairie dog colonies in or near the project area.

Effects of the Proposed Project: The Proposed Action will have no effect on black-footed ferrets. There is no identified habitat for black-footed ferrets on the Bridger lands.

E-1.5.2.2 Colorado River fish species: Bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), Humpback chub (*Gila cypha*), and Razorback sucker (*Xyrauchen texanus*)

Existing Environment: Bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker are native to the Upper Colorado River Basin within mainstem river channels, not the project area's headwater streams. The streams in the area of the Bridger lands are Upper Colorado River headwater streams.

Effects of the Proposed Action: The Proposed Action may affect, but is not likely to adversely affect these four fish species and their habitat. Any effects are likely to be beneficial. If the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure E-2, which would extend USFS and BLM management onto the Bridger parcels. The lands and minerals would not be available for private subdivisions and development, which could potentially lead to development of water depletion projects in the Colorado River System headwater streams in the area of the Bridger lands that could adversely impact these species inhabiting the downstream reaches of the basin.

E-1.5.3 Proposed Species

E-1.5.3.1 Mountain plover (*Charadrius montanus*)

Existing Environment: Mountain plover is a potential resident in shortgrass prairie and shrub-steppe landscapes. The Bridger lands are primarily forested. No potential habitat exists in the project area.

Effects of the Proposed Project: The Proposed Action will have no effect on mountain plover.

E-1.5.4 Experimental Species

E-1.5.4.1 Gray wolf (*Canis lupus*)

Existing Environment. Three of the Greater Yellowstone Area packs, the Teton, Gros Ventre, and Soda Butte packs, all included the BTNF within their home range in 1999. Two of these packs used the BTNF in 2000 and 2001 (Teton and Gros Ventre packs). Pack activity has been predominantly on the Teton Division of BTNF, a considerable distance north of the project area. Single wolves have been documented on the Pinedale Ranger District, Grey's River District, and as far south as Kemmerer. Conflicts have occurred between

wolves and domestic livestock and dogs both on USFS system lands and on private lands as far south as Kemmerer. No single wolf or pack activity has been documented on the Bridger parcels.

Effects of Proposed Project: The Proposed Action may affect but is not likely to jeopardize the continued existence of the experimental gray wolf population. If the exchange is completed, USFS and BLM would acquire surface and mineral ownership of the Bridger lands shown in Figure E-2, which would extend USFS and BLM management onto the Bridger parcels. This would facilitate habitat management and protection of gray wolves on the tracts by the USFS and BLM. The lands and minerals would not be available for private subdivision and development that could potentially adversely affect gray wolves if they do establish a presence in this area in the future.

E-1.5.5 Candidate Species

E-1.5.5.1 Black-tailed prairie dog (*Cynomys ludovicianus*)

Existing Environment: Black-tailed prairie dogs are primarily found in the eastern half of Wyoming. Based on USFS observations, there are no prairie dog colonies in or near the project area.

Effects of the Proposed Project: The Proposed Action will have no effect on black-tailed prairie dogs as there are no prairie dog colonies on or near the Bridger lands.

E-1.5.5.2 Western boreal toad (*Bufo boreas boreas*)

Existing Environment: The western boreal toad is provided candidate status only in the "Southern Rocky Mountain DPS". In Wyoming, the southeastern portion of the state is where this DPS is located. The Bridger lands are not within the range of this western boreal toad DPS.

Effects of the Proposed Project: In the BTNF, the Proposed Action will have no effect on this western boreal toad DPS.

E-1.5.5.3 Yellow-billed cuckoo (*Coccyzus americanus*)

Existing Environment: The range of the western yellow-billed cuckoo encompasses the Bridger lands. This species prefers primarily riparian areas dominated by cottonwoods and willows. The Bridger lands provide only marginal habitat for this species. The yellow-billed cuckoo has never been recorded on these lands.

Effects of the Proposed Project: The Proposed Action may affect, but is not likely to adversely affect the yellow-billed cuckoo. Any effects would be likely to be beneficial. If the exchange is completed, the USFS and BLM would acquire

surface and mineral ownership of the Bridger Lands shown in Figure E-2, which would extend USFS and BLM management onto the Bridger parcels. The lands and minerals would not be available for private development that could potentially lead to loss of the marginal yellow-billed cuckoo habitat that is present on the Bridger lands.

E-1.5.5.4 Arctic grayling (*Thymallus arcticus*)

Existing Environment: The arctic grayling is provided candidate status within the "Fluvial Arctic Grayling, Upper Missouri River DPS". Within Wyoming, this range is confined to the extreme northwestern portion of the state and does not include these Bridger lands.

Effects of the Proposed Project: The Proposed Action for these BTNF and BLM lands will have no effect on this arctic grayling DPS.

E-1.5.6 Cumulative Effects

Acquisition of the Bridger lands would have small but beneficial cumulative effects on the threatened, endangered, proposed, and candidate plant and animal species in these areas because the tracts offered for exchange are relatively small inholdings of private land surrounded by USFS- and BLM-administered lands. Federal surface management would be extended onto the Bridger inholdings and the opportunity for private surface development, such as subdivisions and/or construction activities that could potentially impact threatened, endangered, proposed, and candidate species or their habitats on these lands and the surrounding public lands, would be eliminated.

E-1.6 JO RANCH LANDS

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

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

T.16N., R.91W., 6th P.M., Wyoming
Section 12: NE¼NE¼, SW¼NE¼, SW¼SW¼, E½SW¼, W½SE¼;

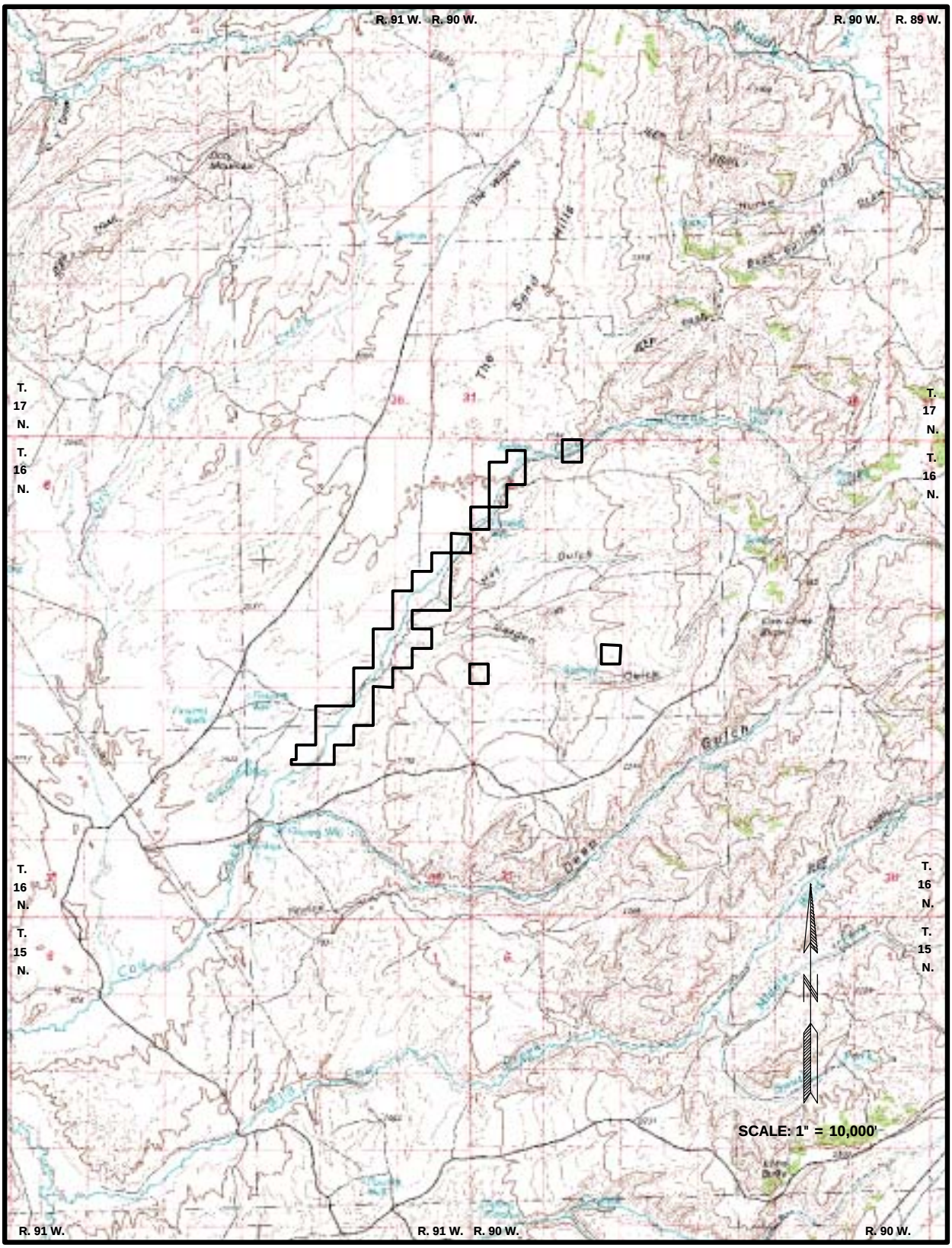


Figure E-3. JO Ranch Lands Location Map.

Section 13: W½NW¼,
SE¼NW¼,
NW¼SW¼;
Section 14: SE¼NE¼,
NE¼SE¼,
S½SE¼;
Section 22: SE¼SE¼,
SE¼SE¼SW¼SE¼;
Section 23: W½NE¼,
S½NW¼, N½SW¼,
SW¼SW¼.
Total: 1,233.55 acres more or less.

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

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

Table E-1.3 is a list of threatened, endangered, proposed, and candidate species that might be present in the area of JO Ranch lands (Carbon County, Wyoming) based on information provided to the BLM by the USFWS in September 2002 (USFWS 2002b) and verbally updated in April 2003.

E-1.6.1 Threatened Species

E-1.6.1.1 Bald eagle (*Haliaetus leucocephalus*)

Existing Environment: The JO Ranch lands are generally not considered bald eagle habitat due to the lack of large trees for nesting and/or large perennial streams for foraging. There is the potential for bald eagles to migrate through the area or to winter in the region.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, bald eagles or their habitat. Any effects are likely to be beneficial. If the exchange is completed, the BLM would acquire the surface ownership of the JO Ranch lands shown on Figure E-3. This would extend BLM management onto the JO Ranch lands. The surface lands would not be readily available for private subdivision and development that could lead to habitat loss. The rights to develop the mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

Table E-1.3. Occurrence of Threatened, Endangered, Proposed, and Candidate Species in the Area of the JO Ranch Lands.

Status	Name	Occurrence*
Threatened:	Bald eagle (*Haliaetus leucocephalus*)	K
	Canada lynx (*Lynx canadensis*)	NS
	Ute ladies'-tresses (*Spiranthes diluvialis*)	NS
	Platte River Species	NS
Endangered:	Black-footed ferret (*Mustela nigripes*)	NS
	Bonytail chub (*Gila elegans*)	NS
	Colorado pikeminnow (*Ptychocheilus lucius*)	NS
	Humpback chub (*Gila cypha*)	NS
	Razorback sucker (*Xyrauchen texanus*)	NS
	Blowout penstemon (*Penstemon haydenii*)	NS
	Platte River Species	NS
Proposed:	Mountain Plover (*Charadrius montanus*)	NS
Candidate:	Black-tailed prairie dog (*Cynomys ludovicianus*)	NS
	Western boreal toad (*Bufo boreas boreas*)	NS
	Yellow-billed cuckoo (*Coccyzus americanus*)	NS
	Arctic grayling (*Thymallus arcticus*)	NS

*Occurrence Key: K = known, S = suspected in area of influence of Proposed Action, NS = not suspected in area of influence of Proposed Action

E-1.6.1.2 Canada lynx (*Lynx canadensis*)

Existing Environment: Habitat for the Canada lynx does not occur on the JO Ranch lands. The Canada lynx has not been recorded in this area.

Effects of Proposed Project: If the exchange is completed as proposed, there should be no effect on Canada lynx because habitat for this species is not present on the JO Ranch lands or in the vicinity.

E-1.6.1.3 Platte River species: Bald eagle (*Haliaeetus leucocephalus*), Piping plover (*Charadrius melodus*), and Western prairie fringed orchid (*Platanthera praeclara*)

Existing Environment: Concerns for these species were presented in association with the Platte River drainage system. The JO Ranch lands are located within the Colorado River drainage system, on the opposite side of the continental divide from the Platte River drainage system.

Effects of Proposed Project: If the exchange is completed as proposed, there should be no effect on the Platte River species because the JO Ranch is not within the Platte River drainage system.

E-1.6.1.4 Ute ladies'-tresses (*Sprianthes diluvialis)*

Existing Environment: There is potential for Ute ladies'-tresses to occur on these lands; however, there are no known occurrences of the plant in Carbon County. The JO Ranch lands have not been surveyed for Ute ladies'-tresses.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, Ute ladies'-tresses or their habitat. Any effects are likely to be beneficial. If the exchange is completed, the BLM would acquire the surface ownership of the JO Ranch lands shown on Figure E-3. This would extend BLM habitat management onto the JO Ranch lands. The surface lands would not be available for subdivision and/or private development that could lead to habitat loss. The rights to develop the mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.6.2 Endangered Species

E-1.6.2.1 Black-footed ferret (*Mustela nigripes*)

Existing Environment: Black-footed ferrets are potential residents in prairie dog (*Cynomys* sp.) colonies. The JO Ranch lands could potentially be inhabited by prairie dogs, probably white-tailed prairie dogs (*Cynomys leucurus*), because black-tailed prairie dogs are primarily found in the eastern half of Wyoming. No occurrences of black-footed ferrets have been reported in this area.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect the black-footed ferret and its habitat. If the exchange is completed as proposed, the BLM would acquire the surface ownership of the JO Ranch lands shown in Figure E-3, which would extend BLM management onto the JO Ranch lands. This would allow habitat management and protection of T&E species on these lands by the BLM. These surface lands would not be available for subdivision and/or private development, which could possibly affect potential black-footed ferret habitat. The rights to develop the

mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.6.2.2 Colorado River fish species: Bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), Humpback chub (*Gils cypha*), and Razorback sucker (*Xyrauchen texanus*)

Existing Environment: The bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker are native to the Upper Colorado River Basin within mainstream channels. Cow Creek, which flows through the JO Ranch lands, is a tributary of the Little Snake River. The Colorado River fish species do occur in the Little Snake River in Colorado.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect these four fish species or their habitat. Any effects are likely to be beneficial. These fish species do not inhabit the JO Ranch lands, although Cow Creek is a tributary to the Little Snake River. If the exchange is completed as proposed, the BLM would acquire the surface ownership of the JO Ranch lands shown in Figure E-3 and management of the portion of Cow Creek that crosses those lands. This would make any proposed water depletion project involving that stretch of Cow Creek a federal action, which would require formal consultation. These lands would not be available for subdivision and/or private development. The rights to develop the mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.6.2.3 Blowout penstemon (*Penstemon haydenii*)

Existing Environment: Habitats suitable for the presence of the blowout penstemon consist of blowout-like sand dunes in early successional stages with very little vegetative cover. No suitable habitat exists on the JO Ranch lands.

Effects of Proposed Project: If the exchange is completed as proposed, there should be no effect on blowout penstemon because habitat for this species is not present on the JO Ranch lands.

E-1.6.2.4 Platte River species: Whooping crane (*Grus americana*), Interior least tern (*Sterna antillarum*), Pallid sturgeon (*Scaphirhynchus albus*), and Eskimo curlew (*Numenius borealis)*

Existing Environment: Concerns for these species were presented in association with the Platte River drainage system. The JO Ranch lands are located within the Colorado River drainage system, on the opposite side of the continental divide from the Platte River drainage system.

Effects of Proposed Project: The proposed action is not likely to affect the Platte River species because the JO Ranch is not within the Platte River drainage system.

E-1.6.3 Proposed Species

E-1.6.3.1 Mountain plover (*Charadrius montanus*)

Existing Environment: The mountain plover could potentially occur on the JO Ranch lands on level, sparsely vegetated sites. However, this species has never been recorded breeding on these lands.

Effects of Proposed Project: If the exchange is completed as proposed, the BLM would acquire the surface ownership of the JO Ranch lands. The proposed land exchange may affect, but is no likely to jeopardize the continued existence of the mountain plover. Any effects are likely to be beneficial. The acquisition of these lands by the BLM would allow protection of any mountain plover habitat that is present from surface development by the private sector. The rights to develop the mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.6.4 Candidate Species

E-1.6.4.1 Black-tailed prairie dog (*Cynomys ludovicianus*)

Existing Environment: The JO Ranch lands are generally out of the habitat range of the black-tailed prairie dog, which is primarily found in eastern Wyoming. Black-tailed prairie dogs have not been recorded on or adjacent to the JO Ranch lands.

Effects of Proposed Project: The proposed action should have no effect on black-tailed prairie dogs since they are not present in the area.

E-1.6.4.2 Western boreal toad (*Bufo boreas boreas*)

Existing Environment: The western boreal toad is provided candidate status only in the "Southern Rocky Mountain DPS". In Wyoming, the southeastern portion of the state is where this DPS is located. The JO Ranch lands are adjacent to, but not within, the range of this western boreal toad DPS. That is because the JO Ranch lands occur at elevations well below those required for this species and known suitable habitats for this species are not present.

Effects of the Proposed Project: The Proposed Action will have no effect on this western boreal toad DPS since known suitable habitats for this species will not be affected.

E-1.6.4.3 Yellow-billed cuckoo (*Coccyzus americanus)*

Existing Environment: The range of the western yellow-billed cuckoo DPS encompasses the JO Ranch lands. This species prefers primarily riparian areas dominated by cottonwoods and willows. The JO Ranch lands provide only marginal habitat for this species. The yellow-billed cuckoo has never been recorded on the JO Ranch lands.

Effects of the Proposed Project: The Proposed Action may affect, but is not likely to adversely affect the yellow-billed cuckoo. Any effects are likely to be beneficial. If the exchange is completed, the BLM would acquire surface ownership of the JO Ranch lands. The surface lands would not be available for private development that could potentially lead to the loss of the marginal yellow-billed cuckoo habitat present. The rights to develop the mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.6.4.4 Arctic grayling (*Thymallus arcticus*)

Existing Environment: The arctic grayling is only provided candidate status within the "Fluvial Arctic Grayling, Upper Missouri River DPS". Within Wyoming, this range is confined to the extreme northwestern portion of the state and does not include these JO Ranch lands.

Effects of the Proposed Project: The Proposed Action for the transfer of the surface ownership of the JO Ranch lands to the BLM will have no effect on this arctic grayling DPS.

E-1.6.5 Cumulative Effects

Acquisition of the JO Ranch lands would have small but beneficial cumulative effects on the threatened, endangered, proposed, and candidate plant and animal species in these areas because the tracts offered for exchange are relatively small inholdings of private land surrounded by BLM-administered lands. Federal surface management in these areas would be consolidated and the opportunity for private surface development, such as subdivisions and/or construction activities that could potentially impact threatened, endangered, proposed, and candidate species or their habitats on these lands and the surrounding public lands, would be eliminated.

E-1.7 WELCH LANDS

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

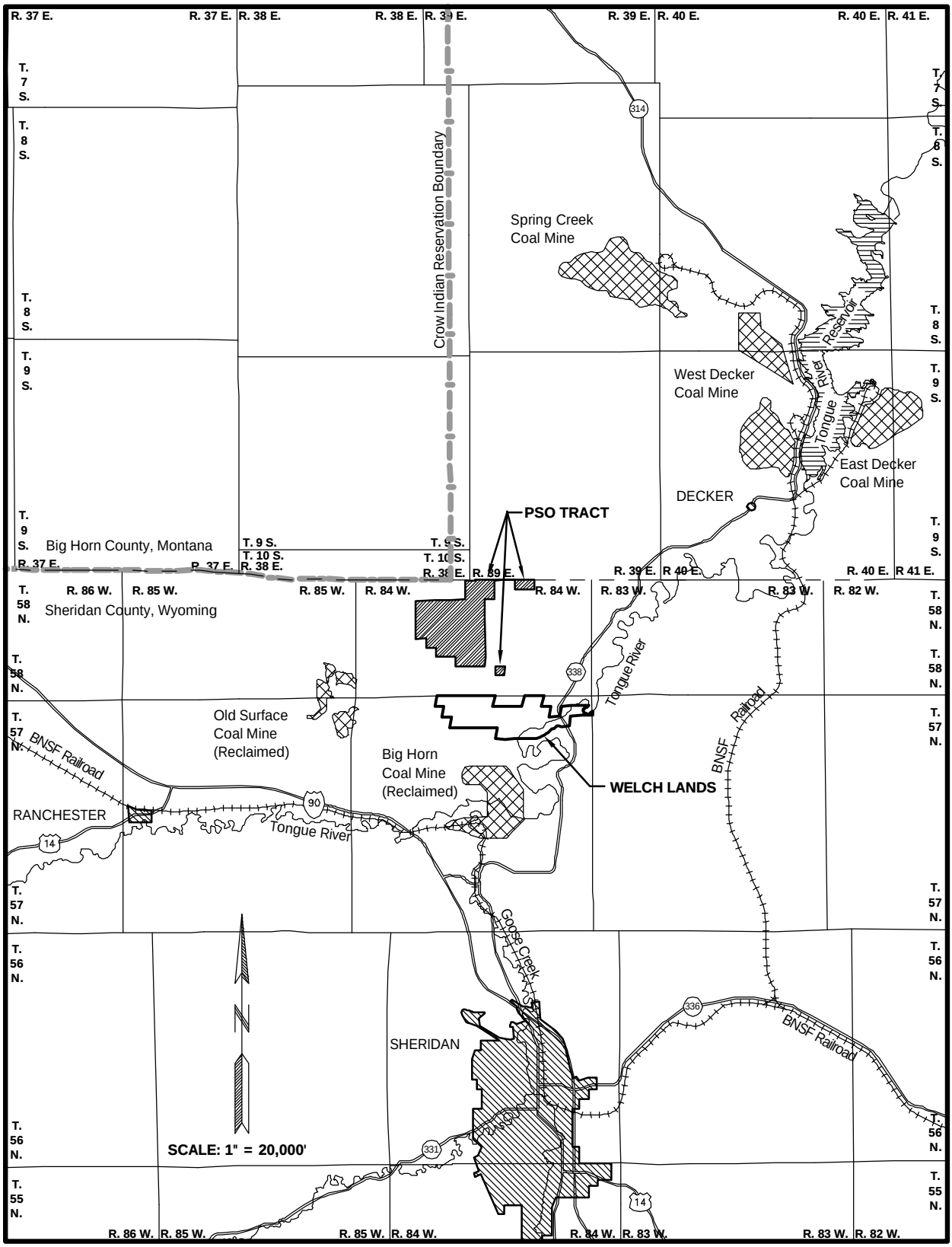


Figure E-4. Welch Lands and PSO Tract Location Map.

Lands

T.57N., R.84W., 6th P.M., Wyoming

Section 1:	S½NE¼	(minus a metes and bounds exclusion area of 25.51 acres),
	SE¼NW¼,	
	N½SW¼	(minus a metes and bounds exclusion area of 1.2 acres),
	SW¼SW¼	(minus a metes and bounds exclusion area of 10.6 acres);
Section 2:	Lots 2, 3,	
	S½N½,	
	S½	(minus a metes and bounds exclusion area of 5.6 acres);
Section 3:	Lots 3,4,	
	S½N½,	
	N½S½,	
	SE¼SE¼;	
Section 4:	Lots 1 through 4,	
	S½NE¼,	
	SE¼NW¼,	
	N½SE¼.	

Total: 1,538.70 acres more or less.

Minerals

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

T.57N., R.84W., 6th P.M., Wyoming

Section 1:	S½NE¼	(excluding 25.51 acres),
	SE¼NW¼,	
	N½SW¼	(excluding 1.2 acres);
Section 2:	S½NW¼,	
	S½	(excluding 5.6 acres);
Section 3:	S½NE¼,	
	SE¼NW¼,	
	N½SE¼,	
	SE¼SE¼.	

Total: 807.69 acres more or less.

The remaining 731.01 acres of coal estate in the Welch lands are federally owned. P&M does not own and is not offering to exchange any non-coal mineral rights underlying the Welch lands.

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

Table E-1.4 is a list of threatened, endangered, proposed, and candidate species known or suspected to occur in Sheridan County, Wyoming based on information provided to the BLM by the USFWS in September 2002 (USFWS 2002b) and verbally updated in April 2003. Both the Welch lands and the PSO Tract are in Sheridan County.

Table E-1.4. Occurrence of Threatened, Endangered, Proposed, and Candidate Species in the Area of the Welch Lands and the PSO Tract.

Status	Name	Occurrence*
Threatened:	Bald eagle (*Haliaetus leucocephalus*)	K
	Canada lynx (*Lynx canadensis*)	NS
	Ute ladies'-tresses (*Spiranthes diluvialis*)	NS
Endangered:	Black-footed ferret (*Mustela nigripes*)	NS
Proposed:	Mountain plover (*Charadrius montanus*)	NS
Candidate:	Black-tailed prairie dog (*Cynomys ludovicianus*)	K
	Western boreal toad (*Bufo boreas boreas*)	NS
	Yellow-billed cuckoo (*Coccyzus americanus*)	NS
	Arctic grayling (*Thymallus arcticus*)	NS

* Occurrence Key: K=known, S=suspected in area of influence of Proposed Action, NS=not suspected in area of influence of Proposed Action.

E-1.7.1 Threatened Species

E-1.7.1.1 Bald eagle (*Haliaetus leucocephalus*)

Existing Environment: There is bald eagle habitat available in the analysis area. Bald eagles are a common winter resident along the Tongue River that flows through the Welch lands and have been observed and documented on the Welch lands. No roost locations or nest sites have been identified on the Welch lands; however, there is an active bald eagle nest approximately two miles downstream from the Welch lands on the Tongue River (Figure E-4).

Effects of the Proposed Project: The Proposed Action may affect, but is unlikely to adversely affect, bald eagles or their habitat on the Welch lands. Any effects are likely to be beneficial. If the exchange is completed, BLM would acquire ownership of the surface and remainder of the non-federal coal estate on the Welch lands. This would facilitate habitat management and protection of T&E species on these lands by the BLM. If the exchange is completed, future management of the land acquired in the Buffalo Field Office area would be determined through additional NEPA analysis/planning decisions. The surface lands and coal would not be available for subdivision and/or private development that could potentially adversely affect bald eagles utilizing this area in the future. The rights to develop the remainder of the mineral estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.7.1.2 Canada lynx (*Lynx canadensis*)

Existing Environment: The Canada lynx is listed by the USFWS as potentially occurring in the region; and the Bighorn National Forest has recorded five Canada lynx observations between 1969 and 1988. All of the sightings were northwest of Buffalo, Wyoming, and occurred at higher elevations than are present in the area of the Welch lands (Bills 2002). It is unlikely that habitat for this species exists in the area of the Welch lands.

Effects of the Proposed Project: If the exchange is completed as proposed, it may affect, but is not likely to adversely affect Canada lynx because it is not likely that suitable habitat for this species occurs in the area of the Welch lands. Any effect is likely to be beneficial. If the exchange is completed, the BLM would acquire ownership of the surface and the remaining non-federal coal estate on the Welch Ranch lands, shown on Figure E-4. The surface lands would not be available for subdivision and/or private development. The rights to develop the oil and gas estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.7.1.3 Ute ladies'-tresses (*Spiranthes diluvialis*)

Existing Environment: This species is known from four populations in Wyoming, within Converse, Goshen, Laramie, and Niobrara Counties. The occurrence on Antelope Creek in Converse County, which is the closest to the Welch lands, is located more than 100 miles southeast of the Welch lands. There is potential for Ute ladies'-tresses to occur in suitable habitats on these lands. The Welch lands have not been surveyed for Ute ladies'-tresses.

Effects of Proposed Project: The Proposed Action may affect, but is not likely to adversely affect, Ute ladies-tresses' or their habitat. Any effects are likely to be beneficial. If the exchange is completed, the BLM would acquire ownership of the surface and the remaining non-federal coal estate on the Welch lands, shown on Figure E-4. The surface lands would not be available for subdivision and/or private development that could adversely affect potential habitat for Ute ladies'-tresses. The rights to develop the oil and gas estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.7.2 Endangered Species

E-1.7.2.1 Black-footed ferret (*Mustela nigripes*)

Existing Environment: The Welch lands are within the historical range of the black-footed ferret, although no black-footed ferrets are presently known to occur in northeastern Wyoming. Surveys to identify any populations of this species within the area administered by the BLM Buffalo Field Office (Campbell, Johnson, and Sheridan Counties, Wyoming) have been unsuccessful, although suitable habitat exists. This endangered species is found almost exclusively living in prairie dog colonies. Black-tailed prairie dogs have been observed or documented on the Welch lands and there is a small (approximately 20 acre) black-tailed prairie dog town on the property. The colony is not large enough to support a black-footed ferret population.

Effects of the Proposed Project: If the exchange is completed as proposed, it may affect but is unlikely to adversely affect, black-footed ferrets. Any effect is likely to be beneficial. BLM would acquire ownership of the surface estate and the remainder of the non-federal coal estate on the Welch lands. Although suitable habitat for black-footed ferrets exists in this area, occurrence of black-footed ferrets in this area is unlikely, and the existing prairie dog colony on the Welch lands is not large enough to support a black-footed ferret population. The rights to develop the oil and gas estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.7.3 Proposed Species

E-1.7.3.1 Mountain plover (*Charadrius montanus*)

Existing Environment: Mountain plover could potentially occur on the Welch lands. The BLM Buffalo Field Office contracted two mountain plover nesting surveys in 2001 (Good et al. 2002, Keinath and Ehle 2001). Keinath and Ehle (2001) located one plover in southern Campbell County, while Good et al. (2002) located five plovers in Johnson County between Buffalo and Kaycee. Localized coalbed methane (CBM)-related mountain plover surveys documented nesting mountain plovers in southern Campbell County. Mountain plover have never been observed in the area of the Welch lands.

Both contracted surveys conclude mountain plover habitat within the Powder River Basin (PRB) may be sparse and fragmented (Good et al. 2002, Keinath and Ehle 2001). Much of the PRB is dominated by rolling sagebrush. Good et al. (2002) believe that bare ground and vegetation height are the limiting habitat components in the basin's prairie communities; the areas they detected mountain plovers within the PRB appeared to receive less precipitation and have greater amounts of short grass prairie than the rest of the basin. However, both surveys caution more suitable mountain plover habitat exists than they were able to survey, as they were limited to public roads (Good et al. 2002, Keinath and Ehle 2001).

Suitable habitat for this species potentially exists on the black-tailed prairie dog town on the Welch lands.

Effects of the Proposed Project: Federal acquisition of the Welch lands may affect but is unlikely to jeopardize the continuing existence of the mountain plover as there is little suitable habitat and there are no known populations of this species in this area. Any effects are likely to be beneficial. If the exchange is completed as proposed, BLM would acquire ownership of the surface and the remainder of the non-federal coal estate on the Welch lands. The rights to develop the oil and gas estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.7.4 Candidate Species

E-1.7.4.1 Black-tailed prairie dog (*Cynomys ludovicianus*)

Existing Environment: There is black-tailed prairie dog habitat available in the analysis area. There is a small (approximately 20 acre) black-tailed prairie dog town on the Welch lands and black-tailed prairie dogs have been observed or documented in the area. Several other colonies are known to exist within several miles of the Welch lands.

Effects of the Proposed Project: The Proposed Action may affect, but is unlikely to adversely affect, black-tailed prairie dog individuals or populations or their habitat on the Welch lands. Any effects are likely to be beneficial. If the exchange is completed, BLM would acquire ownership of the surface estate and part of the coal estate on the Welch lands. This would facilitate habitat management and protection of T&E species on these lands by the BLM. If the exchange is completed, future management of the land acquired in the Buffalo Field Office area would be determined through additional NEPA analysis/planning decisions. The lands would not be available for subdivision and/or private development that could potentially adversely affect black-tailed prairie dogs in the future. The rights to develop the oil and gas estate would not be changed if the exchange is completed, but BLM would be involved in any proposed development projects as the surface owner.

E-1.7.4.2 Western boreal toad (*Bufo boreas boreas*)

Existing Environment: The western boreal toad is provided candidate status only in the "Southern Rocky Mountain DPS". In Wyoming, the southeastern portion of the state is where this DPS is located. The Welch lands are not within the range of this western boreal toad DPS.

Effects of the Proposed Project: The Proposed Action will have no effect on this western boreal toad DPS since this species does not occur on the Welch lands and known habitats for this species will not be affected.

E-1.7.4.3 Yellow-billed cuckoo (*Coccyzus americanus*)

Existing Environment: The range of the western yellow-billed cuckoo DPS does not encompass the Welch lands. The western yellow-billed cuckoo is listed as a candidate species in the portion of this species' range located west of the continental divide.

Effects of the Proposed Project: The Proposed Action will not affect the western yellow-billed cuckoo DPS because this DPS does not occur on the Welch lands.

E-1.7.4.4 Arctic grayling (*Thymallus arcticus*)

Existing Environment: The arctic grayling is provided candidate status within the "Fluvial Arctic Grayling, Upper Missouri River DPS". Within Wyoming, this range is confined to the extreme northwestern portion of the state and does not include these Welch lands.

Effects of the Proposed Project: The Proposed Action for the Welch lands will have no effect on this arctic grayling DPS.

E-1.7.5 Cumulative Effects

Acquisition of the Welch lands, which are surrounded by other private lands, would have a small but beneficial cumulative effect on threatened, endangered, proposed, and candidate species on these lands because the opportunity for private surface development, such as subdivisions or construction activities that could impact threatened, endangered, proposed, and candidate species or their habitat, would be eliminated. Under the Proposed Action, if these lands are acquired the BLM Buffalo Field Office would determine future management of these lands through additional NEPA analyses and planning decisions. Opportunities for recreational activities on the Welch lands would be increased if they become public lands, which may have impacts on threatened, endangered, proposed, and candidate species. Applications could be filed to lease the coal that would be acquired by the federal government on the Welch lands. Such a lease application would be reviewed for compliance with the Buffalo RMP and would be reviewed with respect to the four coal planning screens to determine if the coal is acceptable for further consideration for leasing. If the coal was determined to be acceptable for leasing, the application would be reviewed by the Powder River Regional Coal Team (PRRCT), as it would require a new mine start. If the PRRCT recommended BLM process the application, it would be processed as required under 43 CFR 3425, and a NEPA analysis would be prepared. Opportunities for oil and gas development would be unchanged on these lands because the oil and gas estate would remain in private ownership.

E-1.8 PSO TRACT

The location of the PSO Tract is shown in Figure E-4. If the exchange is completed under the Proposed Action, which is the preferred alternative of the BLM and USFS, P&M would acquire an amount of federal coal equivalent in value to the properties they are offering for exchange. For the purposes of this analysis, it is assumed that P&M would acquire all of the federal coal underlying the PSO Tract, which is described as follows:

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

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

Section 34: SW¼NE¼,
NW¼NW¼.

Total: 2,045.53 acres more or less.

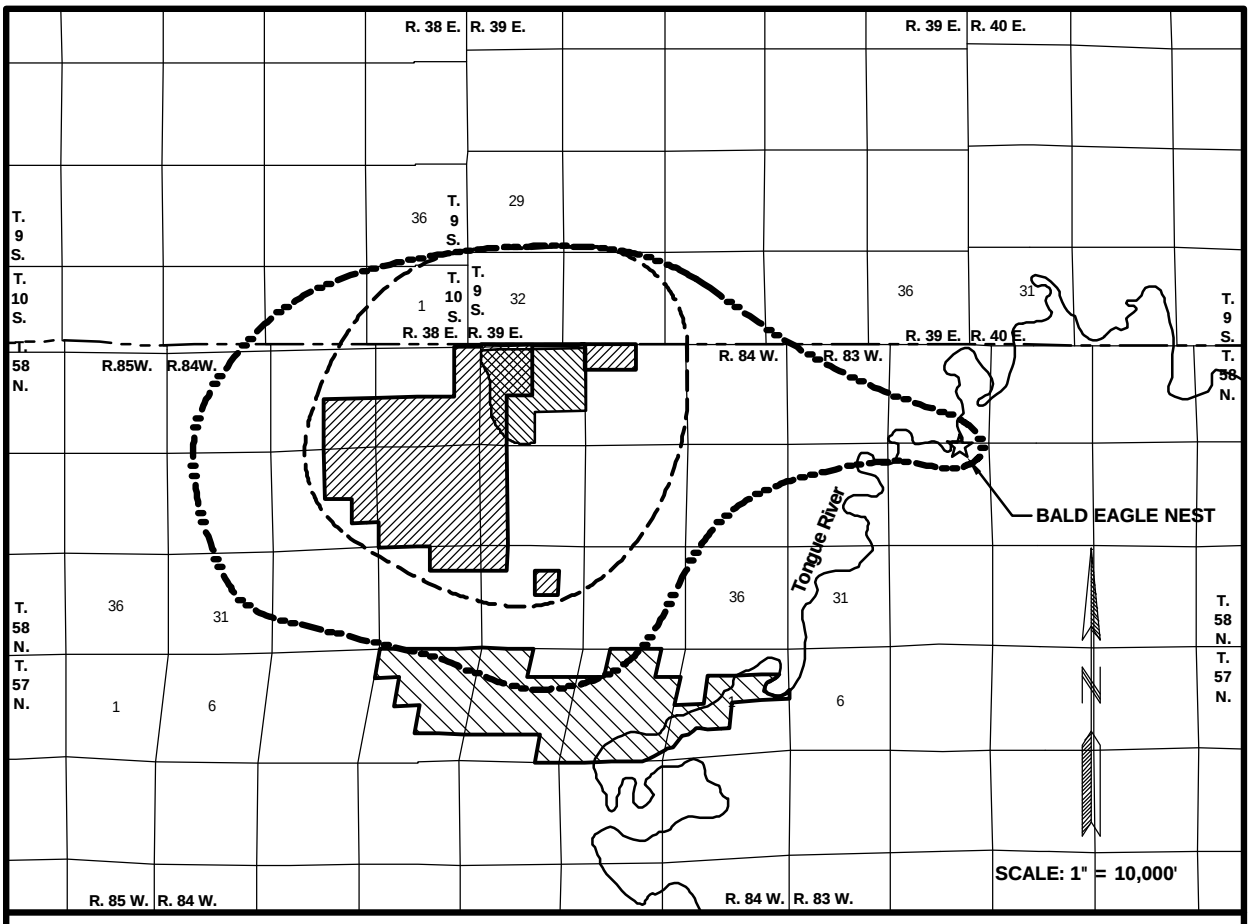
The majority of the surface of the PSO Tract is privately owned, and P&M is the primary private surface owner. There are 6.41 acres of BLM-administered public surface included in the PSO Tract.

If P&M acquires the coal included in the PSO Tract, they propose to open a surface coal mine and recover the coal in the tract. There is privately-owned coal adjacent to the PSO Tract that could be mined when the PSO Tract is mined. P&M does not own this coal, which could also be mined with other private or federal coal in this area. There are currently no federal coal leases in Sheridan County, Wyoming. Federal coal is being mined at two nearby active surface coal mines in Montana (Decker and Spring Creek, see Figure E-4).

Approval of this exchange would not constitute an authorization to mine, however this biological assessment considers the potential impacts of mining because that is a potential outcome of approving this exchange.

The P&M Ash Creek Mine is a surface coal mine located north of Sheridan that was permitted with the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) in 1976 as the PSO No. 1 Mine (Mine Permit No. 407) (Figure E-5). This was prior to the passage of the Surface Mining Control and Reclamation Act (SMCRA). This mine is located in the northeast quarter of Section 22, T.58N., R.84W., adjacent to the federal coal being considered for exchange (Figure E-5). An initial box cut, overlying privately owned coal, was opened in the late 1970s. The majority of the topsoil and overburden were removed between 1976 and 1978. The mine plan was contingent upon approval and construction of a proposed railroad spur for an adjacent proposed mine in Montana. No method of coal transportation was built and all operations ceased in 1980. All activities were suspended from 1980 to 1995, when reclamation began. Reclamation was completed and a full area bond release request by the Ash Creek Mining Company was granted by WDEQ/LQD in 1996. WDEQ Permit No. 407 was transferred from Central and Southwest Services, parent company of the Ash Creek Mining Company, to P&M in 1997.

Wildlife monitoring has been ongoing for the P&M Ash Creek Mine and the program was designed to meet the WDEQ/LQD and federal requirements for the annual monitoring and reporting of wildlife activity on coal mining areas (Figure E-5). Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The annual monitoring studies for a mine permit area of this size (less than 500 acres) involve the measurement and assessment of selected wildlife species, and studies are not as detailed as baseline inventories or monitoring programs for larger mines. The monitoring program has continued in accordance with Appendix B of the



LEGEND

Wyoming - Montana State Line

P & M Ash Creek Mine Permit Area

PSO Tract

Welch Lands

BALD EAGLE SURVEYS

Winter survey area. Includes Ash Creek Mine permit area and one-mile radius. PSO Tract area was included in 2001.

Spring survey area. Includes area of all previously inventoried raptor nests and potential nesting habitat on the Ash Creek Mine permit area and one-mile radius. PSO Tract area was included in 2001.

Late spring-early summer survey area. Includes all active raptor nests previously inventoried and potential habitat on the Ash Creek Mine permit area and one-mile radius. PSO Tract area was included in 2001.

BLACK-TAILED PRAIRIE DOG SURVEYS

Includes all previously inventoried towns on the Ash Creek Mine permit area and a one-mile radius. PSO Tract area was included in 2000 and 2001.

BLACK-FOOTED FERRET SURVEYS

Watch is kept for the presence of ferrets within and near active prairie dog towns during all prairie dog town surveys for the Ash Creek Mine (see description above). The PSO Tract area was included in 2000 and 2001. No surveys have been conducted specifically for black-footed ferrets since 1987 in the Ash Creek Mine area.

MOUNTAIN PLOVER SURVEYS

Watch is kept for the presence of plovers during all wildlife surveys for the Ash Creek Mine, particularly within and near active prairie dog towns during all prairie dog town surveys (see description above). PSO Tract area was included in 2000 and 2001.

Figure E-5. T & E Animal Species Survey Areas for the Ash Creek Mine and PSO Tract.

WDEQ/LQD Rules and Regulations. For the Ash Creek Mine, all wildlife species coincidentally observed during wildlife surveys are recorded. Any signs of species that are not visually sighted are also recorded.

The most recent annual wildlife monitoring program for the P&M Ash Creek Mine was conducted by Intermountain Resources of Laramie, Wyoming and the results are included Ash Creek Mine's 2002 Annual Mining and Reclamation Report to the WDEQ/LQD (P&M 2002).

Background information on T&E species in the vicinity of the PSO Tract was drawn from the Intermountain Resources' Ash Creek Mine annual wildlife surveys, WGFD and USFWS records, and personal contacts with WGFD and USFWS biologists. The majority of the PSO Tract has been surveyed during annual wildlife monitoring for the Ash Creek Mine. Surveying efforts were expanded as necessary to include the entire PSO Tract in July 2000 through July of 2001, the results of which are included in this EIS.

Table E-1.4 is a list of threatened, endangered, proposed, and candidate species known or suspected to occur in Sheridan County, Wyoming based on information provided to the BLM by the USFWS in September 2002 (USFWS 2002b) and verbally updated in April 2003.

E-1.8.1 Threatened Species

E-1.8.1.1 Bald eagle (*Haliaetus leucocephalus*)

Existing Environment: Three major wildlife surveying periods for the reclaimed Ash Creek Mine occur every year. Bald eagle surveys are basically conducted separately from, but in conjunction with, raptor surveys as follows:

- On the mine's permit area and a one-mile radius during the winter surveys (January and February) observations are made to specifically record bald eagles' and all other raptors' winter use of the area. Suitable roost habitat within the same area is surveyed for possible new roosts.

- All previously inventoried nests are checked during the spring survey (March and April) to determine whether they are active. Potential nesting habitat on the mine's permit area and a one-mile radius is surveyed for any new nests.

- All active nests are again observed in the late spring-early summer (June and early July) to determine nesting success. Potential nesting habitat on the mine's permit area and a one-mile radius is also resurveyed for any new nests and late nesting species.

Opportunistic observations noting the eagle's general use of the area are ongoing during all wildlife monitoring activities for the Ash Creek Mine. The

bald eagle is a common winter resident and migrant, although bald eagles are typically observed during all surveys. Eagles were not observed in 1994-1996, but have been observed from 1997-2002 during all surveys, either foraging on the area or as a transient. This species nests along the Tongue River and the closest active bald eagle nest to the PSO Tract and Ash Creek Mine is located about three miles east (Figure E-5). This nest has been active in many of the years since its discovery in 1983, including 1999 and 2000. Surveillance of this nest and the area between the nest and the Ash Creek Mine for the possible establishment of a new nest has been part of the Ash Creek Mine's monitoring program for the last 20 years. A new nest is unlikely in this area because optimum nesting habitat does not exist.

Within the BLM Buffalo Field Office Area, bald eagle nests tend to be associated with forested riparian areas that have mature cottonwood trees (Bills 2002). The bald eagle is the only federally listed species that has been observed on the Ash Creek Mine survey area in recent years (Intermountain Resources 2002).

An abundant, readily available food supply, in conjunction with a suitable roost sites, is the primary feature of winter habitat. The majority of wintering eagles are found near open water where they feed on fish and waterfowl. In addition, eagles are known to feed on carrion, small mammals, and game birds. Eagles prefer to forage in areas with the least human disturbance (USFWS 1978, McGarigal et al. 1991). Food availability is probably the single most important factor affecting winter bald eagle distribution and abundance (Steenhof 1976). Although streams are locally important winter foraging habitat, within the BLM Buffalo Field Office area (which includes Sheridan County) small mammals and carrion are the primary food resources. Domestic sheep carrion is the most important winter food resource, and winter bald eagle numbers have correlated with domestic sheep populations (Bills 2002). Bald eagles are opportunistic foragers, and the PSO Tract could provide foraging opportunities.

<u>Effects of the Proposed Project:</u> The proposed land exchange may affect, but is unlikely to adversely affect, bald eagles and their habitat. Freedom from disturbance is important in forage, nest, and roost site selection. Disturbance to nesting eagles can cause nest failure, nest abandonment, and unsuccessful fledging of young. If P&M acquires the federal coal in the PSO Tract and opens a surface coal mine, there would be new levels of human disturbance on the tract that could impact nesting and wintering bald eagles in the area. There are no nests on the PSO Tract or on adjacent areas that are proposed for mining related facilities, which is where disturbance associated with the PSO Tract would be concentrated. Eagles may alter foraging patterns as they fly around areas of active mining activity. Bald eagle foraging habitat would be lost on the tract during mining. This loss of potential prey habitat would be short-term; foraging habitat lost during mining would be replaced as reclamation proceeds on mined-out areas. The potential for eagles to collide with or be electrocuted by electric power lines on the mine site would be

expected to be minimal; utilization of raptor-safe power lines is required under SMCRA [30 CFR 816.97 (e)(1)] and state regulations. An increase in the volume and frequency of traffic on the roads accessing the PSO Tract may result in an increase in vehicular collisions and roadside carcasses. This could result in an increase of bald eagle foraging along roads in this area, which would increase the potential for road kills of foraging bald eagles to occur.

Cumulative Effects: Mineral development, including CBM development and surface coal mining, is the leading cause of habitat loss within the BLM Buffalo Field Office area, which includes Sheridan County. CBM development has occurred and is proposed in this area in both Montana and Wyoming. There are two operating surface coal mines in Big Horn County, Montana (Figure E-4) The Decker Coal Mine and the Spring Creek Coal Mine are located approximately six miles and seven and one-half miles, respectively, northeast of the PSO Tract. The West Decker mine was opened in 1972, the East Decker mine was opened in 1977, and the Spring Creek mine was opened in 1979. Both the Decker and Spring Creek mines are currently producing around 10 million tons of coal annually.

E-1.8.1.2 Canada lynx (*Lynx canadensis*)

Existing Environment: The Canada lynx is listed by the USFWS as potentially occurring in the region and the Bighorn National Forest has recorded five Canada lynx observations between 1969 and 1988. All of the sightings were northwest of Buffalo, Wyoming, and occurred at higher elevations than are present in the area of the PSO Tract (Bills 2002). It is unlikely that suitable habitat for this species exists in the area of the PSO Tract.

Effects of the Proposed Project: If the exchange is completed as proposed, it may affect, but is unlikely to adversely affect Canada lynx because it is not likely that suitable habitat for this species is present in the area of the PSO Tract. Lynx sightings in this area have been reported at higher elevations than are found in the area of the PSO Tract.

Cumulative Effects: Human activities, associated with motorized access, result in the greatest known mortality of adult lynx. Usually this is the result of trapping, poaching, or road kills.

Other factors impacting lynx and their habitat include vegetation management, increasing recreational activities (winter in particular), and increased competition from other predators. Packed ski and snowmobile trails enable predators such as bobcats (*Felis rufus*) and coyotes (*Canis latrans*) to access high elevation areas traditionally occupied only by lynx (Ruediger et al. 2000).

Predator control activities may also affect Canada lynx. Bobcat and coyote control may reduce competition between lynx and these species. However, unintentional take of lynx would be detrimental to lynx recovery.

Potential Canada lynx habitat within the BLM Buffalo Field Office is outside the coal seam and CBM development area. Mineral activities within the BLM Buffalo Field Office do not affect Canada lynx habitat (Bills 2002).

E-1.8.1.3 Ute Ladies'-tresses (*Spiranthes diluvialis*)

Existing Environment: This species is known from four populations in Wyoming, within Converse, Goshen, Laramie, and Niobrara Counties.

There is potential for Ute ladies'-tresses to occur on the PSO Tract; however, suitable habitat is very limited because there are no perennial or ephemeral streams with subirrigation into late July or August within the tract area. Potential habitat for the orchid is limited to those areas on the tract that have been identified as wetlands, which are the 6.2 acres of jurisdictional wetlands associated with man-made stock ponds. Intermountain Resources surveyed all potential habitat areas on the PSO Tract during blooming season in July 2001 and no orchids were found. The two perennial streams that cross the proposed Ash Creek Mine area, Little Youngs Creek and Youngs Creek, provide more potential habitat for Ute ladies'-tresses, although these areas, which are outside of the PSO Tract, have not yet been surveyed. The existing P&M Ash Creek mine permit area (Figure E-5) was surveyed for Ute ladies'-tresses in 1980 and none were found at that time.

Effects of the Proposed Project: Approval of the exchange may affect, but is unlikely to jeopardize the continued existence of the Ute ladies'-tresses. The nearest known population occurrence of this species lies more than 100 miles southeast of the PSO Tract on Antelope Creek in Converse County.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002e). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced with CBM development and discharged on the surface may also alter stream morphology and hydrology. Jurisdictional wetlands located in the PSO Tract and adjacent lands proposed for mining that are destroyed by mining operations would be replace in accordance with COE requirements. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands, but replacement would be in accordance with the requirements of Section 404 of the Clean Water Act, as determined by COE.

E-1.8.2 Endangered Species

E-1.8.2.1 Black-footed ferret (*Mustela nigripes*)

Existing Environment: The BLM Buffalo Field Office area is within the historical range of the black-footed ferret, although no black-footed ferrets are

presently know to occur in northeastern Wyoming (Bills 2002). This endangered species is found almost exclusively living in prairie dog colonies. Several small black-tailed prairie dog towns occur on the PSO Tract and several other colonies are known to exist within several miles of the PSO Tract area (Figure E-6). The existence of these towns means that potential habitat for the black-footed ferret exists and ferrets could potentially occur in the PSO Tract area. As required by the Ash Creek Mine's wildlife monitoring commitments, observations are made to determine the presence of any rare or endangered species within and near active prairie dog towns during the surveys that are within a one-mile radius of the permit area. The potential presence of black-footed ferrets has been considered by wildlife surveyors (Intermountain Resources) during Ash Creek Mine's surveys within active prairie dog towns. Watch is kept during all wildlife monitoring surveys for signs of ferrets but specific surveys have not been conducted for ferrets since 1987 in the Ash Creek Mine area.

The larger towns that occur south and southeast of the Ash Creek Mine permit area were surveyed for ferrets during baseline inventories done in 1976 and again in 1987 according to the then-accepted ferret survey techniques. No sign of ferrets have ever been observed on the entire black-tailed prairie dog complex in the general area.

Effects of the Proposed Project: Approval of the exchange may affect, but is not likely to adversely affect, black-footed ferrets. There is potential black-footed ferret habitat on the tract (several prairie dog towns) that would be affected if a surface coal mine is opened as proposed, but there are no known populations of this species in this area. P&M proposes to mine the coal if they acquire it. Ferret searches of the small prairie dog towns located on the PSO Tract have found no indication of ferrets.

Cumulative Effects: Sylvatic plague, an introduced disease, can infect and eliminate entire prairie dog colonies. Recreational prairie dog shooting may locally reduce prairie dog populations, but seldom eliminates colonies.

Mineral development within black-tailed prairie dog colonies is a leading cause of ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat

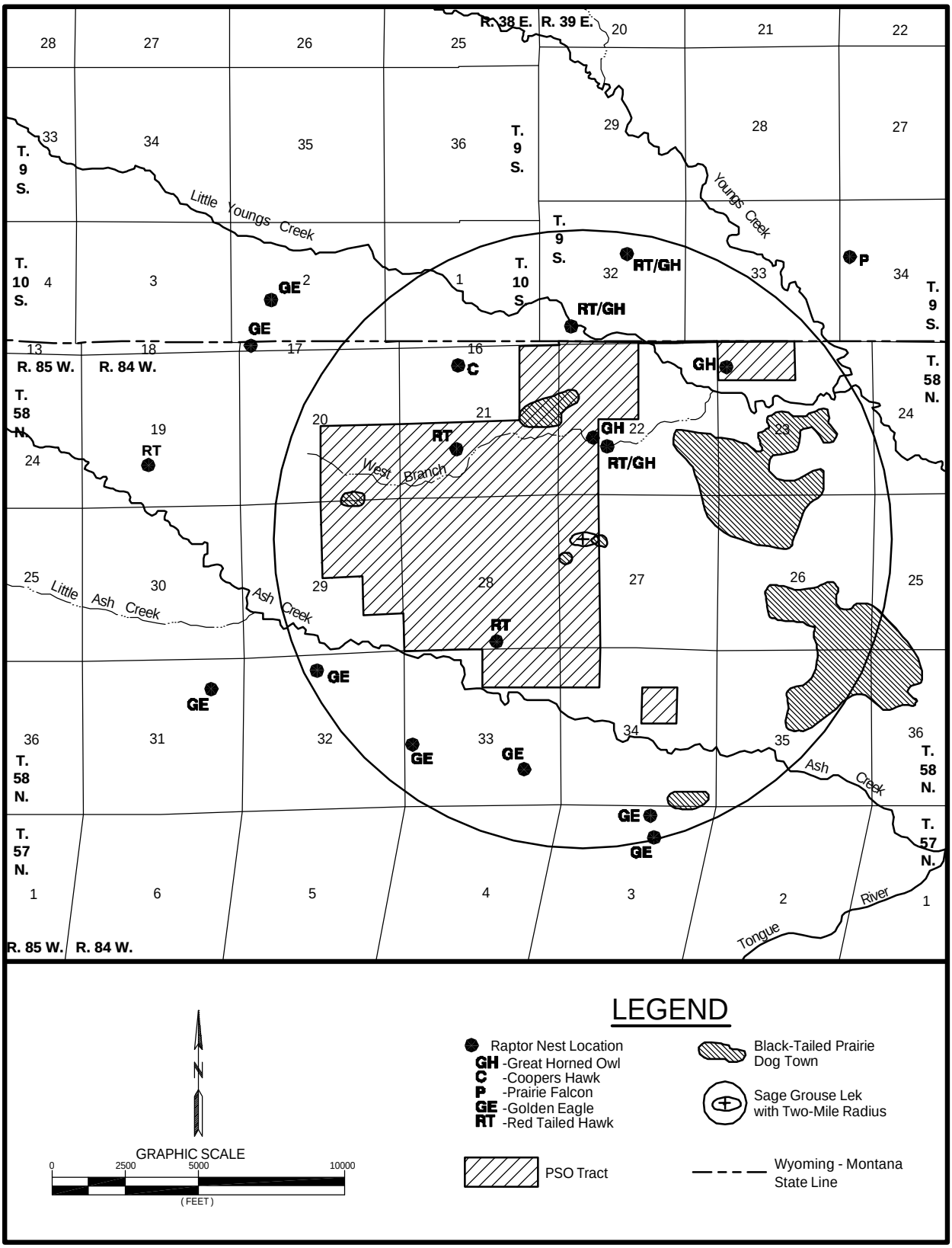


Figure E-6. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the PSO Tract.

composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs in this area.

E-1.8.3 Proposed Species

E-1.8.3.1 Mountain plover (*Charadrius montanus*)

Existing Environment: The BLM Buffalo Field Office contracted two mountain plover nesting surveys in 2001 (Good et al. 2002, Keinath and Ehle 2001). Keinath and Ehle (2001) located one plover in southern Campbell County, while Good et al. (2002) located five plovers in Johnson County between Buffalo and Kaycee. Localized CBM-related mountain plover surveys documented nesting mountain plovers in southern Campbell County. Mountain plover have never been observed in the area of the PSO Tract.

Both contracted surveys conclude mountain plover habitat within the PRB may be sparse and fragmented (Good et al. 2002, Keinath and Ehle 2001). Much of the PRB is dominated by rolling sagebrush. Good et al. (2002) believe that bare ground and vegetation height are the limiting habitat components in the basin's prairie communities; the areas they detected mountain plovers within the Powder River Basin appeared to receive less precipitation and have greater amounts of short grass prairie than the rest of the basin. However, both surveys caution more suitable mountain plover habitat exists than they were able to survey, as they were limited to public roads (Good et al. 2002, Keinath and Ehle 2001).

Several small black-tailed prairie dog towns occur on the PSO Tract and several other colonies are known to exist within several miles of the PSO Tract (Figure E-6). The existence of prairie dog towns means that potential habitat exists for mountain plovers. As required by the Ash Creek Mine's wildlife monitoring commitments, observations are made to determine the presence of any rare or endangered species within and near prairie dog towns during the prairie dog town surveys that are within a one-mile radius of the permit area (Figures E-5 and E-6). Surveys of previously recorded prairie dog towns are conducted on the Ash Creek Mine's permit area and a one-mile perimeter during the spring survey (March and April) and the late spring-early summer survey (June and early July). Watch is kept for plovers during all wildlife monitoring surveys conducted for the Ash Creek Mine. Suitable habitat on the PSO Tract was surveyed in 2001, but no mountain plovers were observed. Mountain plovers have never been observed on any of these black-tailed prairie dog towns and have not been documented on or near the PSO Tract (Intermountain Resources 2002).

The black-tailed prairie dog towns southeast of the Ash Creek Mine and PSO Tract have not been surveyed specifically for mountain plovers, although they have never been observed during past prairie dog town surveys.

Effects of the Proposed Project: The proposed land exchange may affect, but is unlikely to jeopardize the continued existence of the mountain plover. If the exchange is completed and P&M acquires and mines the coal in the PSO Tract, potentially suitable habitat for mountain plovers on the tract would be disturbed during mining operations. Mountain plovers have not been documented on or near the tract and mountain plovers were not observed during surveys of suitable habitat for this species in 2001 or in any of the past prairie dog town surveys conducted on the PSO Tract.

Cumulative Effects: Mineral development is likely to have both beneficial and detrimental effects on mountain plover. Mining activities tend to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Surface disturbance within suitable habitat will likely result in temporary habitat loss in areas to be reclaimed, and permanent or long-term loss where roads and permanent or long-term facilities are located. Powerpoles, conveyors, and other structures are likely to provide perch sites and hiding cover for mountain plover predators. Vehicle traffic may occasionally run over mountain plovers or their nests. Mineral development may benefit plovers where surface disturbance provides bare ground and reduces shrub cover (Dechant et al. 2001).

Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover often differs from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area, however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs in this area, which could lead to an increase or decrease in potential habitat for mountain plovers in this area.

E-1.8.4 Candidate Species

E-1.8.4.1 Black-tailed prairie dog (*Cynomys ludovicianus*)

Existing Surveys: There is black-tailed prairie dog habitat available in the analysis area. Surveys of previously recorded prairie dog towns and for the presence of any new colonies are conducted on the Ash Creek Mine's permit area and a one-mile perimeter during the spring survey (March and April) and the late spring-early summer survey (June and early July) by Intermountain Resources (Figure E-5). Several small black-tailed prairie dog towns have been observed on the PSO Tract (Figure E-6). These colonies are located in the NE¼ Section 21, NW¼ Section 22, SE¼ Section 20, NE¼ Section 29, and NW¼

Section 27, T.58N., R.84W. Several other colonies are known to exist within several miles of the PSO Tract area. The small town in Sections 21 and 22 has been gradually expanding over the past few years. Prairie dog activity at the larger town located in Sections 22, 23, 26, and 27, T.58N., R.84W. was reduced in 2000 due to apparent control efforts by landowners (Intermountain Resources 2002).

Effects of the Proposed Project: If the exchange is completed as proposed, P&M would acquire ownership of the federal coal included in the PSO Tract. If P&M acquires the federal coal in the PSO Tract and opens a surface coal mine, there would be new levels of human disturbance on the tract and there would be direct and indirect effects on individuals and populations of the black-tailed prairie dog. Individuals and colonies on the tract would be impacted by mine disturbance. Increased vehicle traffic would increase the potential for vehicle collisions, reducing population levels in colonies adjacent to existing and new roads.

E-1.8.4.2 Western boreal toad (*Bufo boreas boreas*)

Existing Environment: The western boreal toad is provided candidate status only in the "Southern Rocky Mountain DPS". In Wyoming, the southeastern portion of the state is where this DPS is located. The PSO Tract is not within the range of this western boreal toad DPS.

Effects of the Proposed Project: The Proposed Action will have no effect on this western boreal toad DPS since this species does not occur on the PSO Tract and known habitats for this species will not be affected.

E-1.8.4.3 Yellow-billed cuckoo (*Coccyzus americanus)*

Existing Environment: The range of the western yellow-billed cuckoo DPS does not encompass the PSO tract. The western yellow-billed cuckoo is only listed as a candidate species in the portion of this species range located west of the continental divide.

Effects of the Proposed Project: The Proposed Action will not affect the western yellow-billed cuckoo DPS because this DPS does not occur on the PSO Tract.

E-1.8.4.4 Arctic grayling (*Thymallus arcticus*)

Existing Environment: The arctic grayling is only provided candidate status within the "Fluvial Arctic Grayling, Upper Missouri River DPS". Within Wyoming, this range is confined to the extreme northwestern portion of the state and does not include the PSO Tract.

Effects of the Proposed Project: The Proposed Action for the PSO Tract will have no effect on this arctic grayling DPS.

E-1.8.5 Regulatory Requirements and Mitigation for the PSO Tract

If the exchange is completed, P&M would acquire ownership of the federal coal included in the PSO Tract. Ownership of the coal would not authorize mining operations. Surface coal mining operations are regulated in accordance with the requirements of SMCRA and Wyoming State regulations. 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. In order to get approval of this cooperative agreement, the state had to demonstrate that the state laws and regulations are no less stringent than, meet the minimum requirements of, and include all applicable provisions of SMCRA.

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

Protection of fish, wildlife, and related environmental values is required under the SMCRA regulations at 30 CFR 816.97, which state:

> "No surface mining activity shall be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary of which is likely to result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973, as amended.".

In addition to requiring the operator to minimize disturbances and adverse impacts on fish, wildlife, and related environmental values, the regulations at 30 CFR 816.97 disallow any surface mining activity which is likely to jeopardize the continued existence of endangered or threatened species and require that the operator use the best technology currently available to minimize electrocution hazards to raptors; locate and operate haul and access roads to avoid or minimize impacts on important fish and wildlife species; and design fences, conveyors, and other potential barriers to permit passage of large mammals. Additional mitigation measures to ensure compliance with the ESA and SMCRA are developed when a detailed mining plan, which identifies

the actual location of the disturbance areas, how and when they would be disturbed, and how they would be reclaimed, is developed and reviewed for approval. That plan is not available for evaluation or development of appropriate mitigation measures specific to an actual proposal to mine at this time.

E-1.8.6 Cumulative Impacts

If the exchange is completed as proposed and P&M acquires and mines the coal in the PSO Tract, the mining operations would contribute to cumulative effects to threatened, endangered, proposed, and candidate plant and wildlife species in the PRB. Other activities that are contributing to cumulative effects to threatened, endangered, proposed, and candidate plant and wildlife species in this area include active surface coal mining operations in Big Horn County, Montana; existing and proposed conventional oil and gas and CBM development in Wyoming and Montana; sand, gravel, and scoria mining; grazing; agriculture; recreational activities; and rural and urban housing development. Mining and construction activities and urban development tend to have more intense impacts on fairly localized areas, while ranching, recreational activities, and oil and gas development tend to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. The net area of energy disturbance in the Wyoming PRB has been increasing. In the short-term, this means a reduction in the available habitat for threatened, endangered, proposed, and candidate plant and wildlife species. In the long-term, habitat will be restored as reclamation proceeds.

Cumulative effects would also occur to threatened, endangered, proposed, and candidate plant and wildlife resources as a result of indirect impacts. One factor is the potential import and spread of noxious weeds around roads and facilities. Noxious weeds have the ability to displace native vegetation and hinder reclamation efforts. If weed mitigation and preventative procedures are applied to all construction and reclamation practices, the impact of noxious weeds on threatened, endangered, proposed, and candidate plants and wildlife would be minimized.

In reclaimed areas, vegetation cover often differs from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the area, however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Establishment of noxious weeds and alteration of vegetation on reclaimed areas has the potential to alter threatened, endangered, proposed, and candidate plant and wildlife habitat composition and distribution. As a result, shifts in habitat composition or distribution may

affect threatened, endangered, proposed, and candidate plant and wildlife species in the PRB.

E-2.0 USFS INTERMOUNTAIN REGION SENSITIVE SPECIES

The following paragraphs summarize the available information on USFS sensitive species that are known to be present or potentially present on the Bridger lands which lie within the BTNF. Sensitive species are defined as those plants and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: 1) significant current or predicted downward trends in population numbers or density, or 2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (USFS Manual 2670.5).

The USFS objective for sensitive species management is to "develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions" (USFS Manual 2670.22). There are numerous sensitive species that do or could occur within the Bridger lands analysis area.

E-2.1 FISH AND WILDLIFE

Table E-2.1 lists fish and wildlife species that have been designated as Sensitive by the Intermountain Region of the USFS and may occur in the Bridger lands analysis area.

Table E-2.1 USFS Intermountain Fish and Wildlife Sensitive Species.

Name	**Occurrence***
Fish:	
Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*)	K
Snake River fine spotted cutthroat trout (*Oncorhynchus clarki* sp.)	NS
Wildlife:	
Spotted frog (*Rana pretiosa*)	S
Common loon (*Gavia immer*)	NS
Harlequin duck (*Histrionicus histrionicus*)	NS
Trumpeter swan (*Cygnus buccinator*)	NS
Boreal owl (*Aegolius funereus*)	S
Flammulated owl (*Otus flammeolus*)	S
Three-toed woodpecker (*Picoides tridactylus*)	S
Townsend's big-eared bat (*Plecotus townsendii*)	NS
Wolverine (*Gulo gulo*)	K
Fisher (*Martes pinnanti*)	NS
Northern goshawk (*Accipiter gentilis*)	S
Great gray owl (*Strix nebulosa*)	S
Spotted bat (*Euderma maculatum*)	NS
Peregrine falcon (*Falco pergrinus*)	NS

*Occurrence Key: K = known, S = suspected in area of influence of proposed action, NS = not suspected in area of influence of Proposed Action.

Suitable habitat exists for spotted frog, flammulated owl, boreal owl, three-toed woodpecker, great gray owl, northern goshawk, wolverine, and fisher.

E-2.1.1 Spotted frog: Population and Habitat Status

No spotted frogs have been located on the Kemmerer Ranger District although suitable habitat exists. The most recent survey work was conducted in Ham's Fork in 1999 (Patla 2000). No survey work has been done on the Bridger lands. Range maps for spotted frogs conflict; some include the Kemmerer Ranger District while others do not.

Spotted frog habitat primarily includes oxbow ponds (without fish) with emergent sedges (*Carex* spp.) located in wet meadows at the edge of lodgepole pine (*Pinus contorta*) forest. Frogs move considerable distances from water after breeding, often frequenting mixed conifer and subalpine forests, grasslands, and shrublands of sagebrush and rabbitbrush. Beaver ponds also provide good spotted frog habitat.

E-2.1.2 Flammulated owl: Population and Habitat Status

Flammulated owls have not been documented on the Kemmerer Ranger District, but no survey work has occurred. This owl prefers ponderosa pine habitat, but will also utilize Douglas-fir, aspen, and/or limber pine. Douglas-fir, aspen, and limber pine are present within the Bridger parcels but in limited quantities. The flammulated owl requires cavities for nesting and forages primarily on forest insects. This owl is suspected to be present, but rare.

E-2.1.3 Boreal owl, Three-Toed woodpecker, Great gray owl, Northern goshawk: Population and Habitat Status

These species inhabit montane stands of coniferous, deciduous and mixed trees. No survey work has been done within the Bridger lands analysis area, but suitable habitat exists, and the lack of documented sightings is probably the result of a lack of survey efforts.

Boreal owls have been documented to the north along the Grey's River. All breeding sites were above 2,100 meters or approximately 6,900 ft (Clark 1994). The boreal owl prefers the high elevation spruce-fir forests or aspen for foraging and nesting. Nesting habitat structure consists of forest with a relatively high density of large trees, open understory, and multilayered canopy. Boreal owls are cavity nesters and are dependent on the presence of primary excavators such as the northern flicker.

No documented sightings of three-toed woodpeckers exist for the Kemmerer Ranger District. These woodpeckers require snags in coniferous forests for nesting, feeding, perching, and roosting. In Wyoming forests, the three-toed woodpecker is found in only large, unbroken stands of mature spruce-fir and

lodgepole pine. Snags with diameters of 12 to 16 inches and heights of 19.6 to 39.4 ft are preferred (USFS 1991). This woodpecker forages on insects, mainly in dead trees, but will also feed in live trees. Wood boring beetles are preferred, and this woodpecker is adapted to shift foraging areas to capitalize on high concentrations of these beetles.

No documented sightings of great gray owls exist for the Kemmerer Ranger District. The great gray owl uses mixed coniferous forests usually bordering small openings or meadows. Semi-open areas where small rodents are abundant, near dense coniferous forests for roosting and nesting, is optimum habitat for the great gray owls. Broken top snags, stumps, dwarf-mistletoe platforms, or old hawk and raven nests are utilized for nesting.

The Wyoming Game and Fish Department (WGFD) Wildlife Observation System contains 38 northern goshawk records since 1979 for the Kemmerer Ranger District. The goshawk prefers old growth forests for nesting but forages in a variety of habitats. Goshawk habitat was modeled for the Commissary Ridge/Tunp Range Landscape Scale Assessment (2001) utilizing the following factors: conifer vegetation, northerly aspects between 270 and 90 degrees, and slopes less than 30 percent. Potential habitat was mostly located in the lower elevations along Hams Fork and Fontenelle Creek.

E-2.1.4 Wolverine and Fisher: Population and Habitat Status

Wolverines inhabit high mountain forests of dense conifers; primarily in true fir (Abies) cover types as well as subarctic-alpine tundra. They are widespread, but occur in low densities. They are difficult to observe so frequency of sightings may not reflect population size. Maintenance of wolverine populations is dependent on large areas free from land-use activities that permanently alter their habitat (USFS 1994). Wolverines have been documented in several locations near the Bridger lands analysis area.

Fishers use closed coniferous and mixed forests. They prefer extensive, mature to old growth spruce-fir forests with high canopy closure. There are no documented sightings on the Bridger parcels, either historic or recent.

E-2.2 PLANT SPECIES

Table E-2.2 lists plant species that have been designated as Sensitive by the Intermountain Region of the USFS that potentially occur in the BTNF.

E-2.2.1 Population and Habitat Status

Four sensitive plant species are known to occur on the Kemmerer Ranger District according to the Wyoming Natural Diversity database: creeping twinpod, Payson's milkvetch, Payson's bladderpod, and Starveling milkvetch.

Table E-2.2. Region 4 - BTNF Potential Sensitive Plant Species.

Species	**Habitat/ Community**	**Elevation (ft)**	**Succession**
Pink agoseris (*Agoseris lackschewitzii*)	Subalpine wet meadow, saturated soils	8,500-10,600	Mid to late
Sweet-flowered rock jasmine (*Androsace chamaejasme* var. *carinata*)	Montane rock crevices in rocky limestone or dolomite soils	8,500-10,800	Mid to late
Soft aster (*Aster mollis*)	Sagebrush grasslands and mountain meadows in calcareous soils	6,400-8,500	Early to mid
Meadow milkvetch (*Astragalus diversifolius* var. *diversifolius*)	Moist, often alkaline meadows and swales in sagebrush valleys	4,400-6,300	Mid
*Starveling milkvetch (*Astragalus jejunus* var. *jejunus*)	Dry barren ridges and bluffs of shale and stone, clay or cobblestones	6,000-7,100	Early to late
*Payson's milkvetch (*Astragalus paysonii*)	Disturbed areas and recovering burns on sandy soil	6,700-9,600	Early
Seaside sedge (*Carex incurviformis*)	Alpine and subalpine moist tundra and wet rock ledges	10,000-12,200	Late
Seaside sedge (*Carex incurviformis*)	Alpine and subalpine moist tundra and wet rock ledges	10,000-12,200	Late
Black and purple sedge (*Carex luzulina* var. *atropurpurea*)	Subalpine wet meadows and stream sides	10,000-10,600	Mid
Wyoming tansymustard (*Descuraania torulosa*)	Sparsely-vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone	8,300-10,000	Early to mid

Table E-2.2. Region 4 - BTNF Potential Sensitive Plant Species.

Species	**Habitat/ Community**	**Elevation (ft)**	**Succession**
Boreal draba (*Draba borealis*)	Moist north-facing limestone slopes and cliffs and shady stream sides	6,200-8,600	Mid
Rockcress draba (*Draba densifolia* var. *apiculata*)	Moist gravelly alpine meadows and talus slopes, often on limestone-derived soils	10,400-12,000	Mid to late
Wooly fleabane (*Erigeron lanatus*)	Alpine or subalpine limestone talus slopes	11,000	Mid to late
Narrowleaf goldenweed (*Haplopappus macronema* var. *linearis*)	Semi-barren, whitish clay flats and slopes, gravel bars, and sandy lake shores	7,700-10,300	Mid to late
*Payson's bladderpod (*Lesquerella paysonii*)	Rocky, sparsely-vegetated slopes, often calcareous substrates	6,000-10,300	Mid to late
Naked-stemmed parrya (*Parrya nudicaulis*)	Alpine talus, often on limestone substrates	10,700-11,400	Early to late
*Creeping twinpod (*Physaria integrifolia* var. *monticola*)	Barren, rocky, calcareous hills and slopes	6,500-8,600	Mid
Greenland primrose (*Primula egaliksensis*)	Wet meadows along streams and calcareous montane bogs	6,600-8,000	Mid
Weber's saw-wort (*Saussurea weberi*)	Alpine talus and gravel fields, often on limestone	10,200-11,200	Mid to late

* Present on Kemmerer Ranger District as per the Wyoming Natural Diversity database

These plants are not documented within the Bridger lands analysis area, although no survey work has occurred.

The following sensitive plant species are probably not present as their habitat requirements are outside the elevation range of the project area (7,200 to 9,300 ft): meadow milkvetch, seaside sedge, black and purple sedge, rockcress draba, wooly fleabane, naked-stemmed parrya, and Weber's saw-wort.

Status of the following species is unknown; they may or may not occur in the Bridger lands analysis area: pink agoseris, sweet-flowered rock jasmine, soft aster, Wyoming tansymustard, boreal draba, narrowleaf goldenweed, and Greenland primrose.

E-2.3 EFFECTS OF THE PROPOSED PROJECT ON USFS INTERMOUNTAIN REGION SENSITIVE SPECIES

The Proposed Action would consolidate USFS management in the area of the Bridger parcels. This would facilitate habitat management and protection of USFS Intermountain Region sensitive species on the tracts by the USFS and ensure that the privately-owned Bridger lands would not be sold to another private party and potentially subdivided in the future.

E-3.0 BLM SENSITIVE SPECIES EVALUATION

BLM Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the ESA, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy Management Act (FLPMA); and the Department Manual 235.1.1A., General Program Delegation, Director, BLM.

The goals of the sensitive species policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure sensitive species are considered in land management decisions.
- Prevent a need for species listing under the ESA.
- Prioritize needed conservation work with an emphasis on habitat.

The following paragraphs summarize the available information on BLM sensitive species that are known to be present or potentially present on the lands that would be acquired by the BLM under the Proposed Action.

E-3.1 DESCRIPTION OF THE PROPOSED ACTION

Under the Proposed Action, BLM would acquire the Bridger lands which lie outside of the BTNF, the JO Ranch lands, and the Welch lands (see Figures E-1, E-2, E-3, and E-4 and the land descriptions in Section 1 of this appendix). The Bridger and JO Ranch lands are private inholdings surrounded by lands administered by the USFS and BLM. The Welch lands are surrounded by private lands. The current owner of the lands being offered for exchange is P&M. P&M is offering to exchange the surface estate of the lands and the portion of the mineral estate that they own on those lands. P&M's ownership of the mineral estate, which is described in Section 1 of this appendix, varies from tract to tract.

If the exchange is completed under the Proposed Action, P&M would acquire an amount of federal coal equivalent in value to the properties they are offering for exchange. For the purposes of this analysis, it is assumed that P&M would acquire all of the federal coal underlying the PSO Tract (see Figures E-4 and the land description in Section E-1.8 of this appendix). The majority of the surface of the PSO Tract is privately owned, and P&M is the primary private surface owner. There are 6.41 acres of BLM-administered public surface included in the PSO Tract. If P&M acquires the coal included in the PSO Tract, they propose to open a surface coal mine and recover the coal in the tract as well as some privately-owned coal adjacent to the tract.

E-3.2 SPECIES OCCURRENCE AND HABITAT DESCRIPTIONS

Sensitive species were listed for the BLM field offices within their range. Numerous sensitive species do or could occur within the tracts being exchanged. Specialized habitat requirements (i.e., caves, cliffs, calcareous rock outcrops) make occupation for other sensitive species unlikely. Table E-3.1 lists BLM sensitive species and summarizes their habitat requirements.

E-3.3 DETERMINATION OF EFFECTS

E-3.3.1 Bridger Lands, JO Ranch Lands, and Welch Lands

The proposed land exchange will be a beneficial effect for sensitive species management on the lands being acquired by BLM.

The BLM will acquire surface ownership of the Bridger lands outside the BTNF, the JO Ranch lands, and the Welch lands. Mineral estates owned by P&M within these tracts would also be exchanged to BLM. Development rights would not remain in private ownership, and the lands would not be available for private development that could impact sensitive species. Future management of the lands acquired by BLM would be determined through additional NEPA analysis/planning decisions where sensitive species management will be considered.

E-3.3.2 PSO Tract

If the exchange is completed, P&M would acquire ownership of the federal coal included in the PSO Tract. The majority of the surface estate of the PSO Tract is privately owned, and P&M is the majority land owner. The PSO Tract does include 6.41 acres of public surface estate, which is administered by BLM. If P&M acquires the federal coal underlying their private surface, they proposed to open a surface coal mine. Surface coal mining operations on the PSO Tract mineral estate may impact individuals and habitat, but is unlikely to lead towards federal listing of BLM sensitive species. BLM would be involved, as the surface managing agency, in reviewing proposed mining operations on the public surface estate included in the PSO Tract.

Table E-3.1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office.

Common Name (*scientific name*)	**Habitat**	**Kemmerer Field Office[1]**	**Rawlins Field Office[2]**	**Buffalo Field Office[3]**
Amphibians				
Boreal toad (*Bufo boreas boreas*)	Pond margins, wet meadows, riparian areas	Yes	Yes	No
Great Basin Spadefoot (*Spea intermontana*)	Spring seeps, permanent and temporary water	Yes	Yes	No
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	Yes	Yes	Yes
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	Yes	No	Yes
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No	Yes	Yes
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes	Yes	Yes
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	Yes	Yes	Yes
Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*)	Grasslands	No	Yes	No
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes	Yes	Yes
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes	Yes	Yes
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes	Yes	Yes
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes	Yes	Yes

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table E-3.1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued).

Common Name (*scientific name*)	**Habitat**	**Kemmerer Field Office[1]**	**Rawlins Field Office[2]**	**Buffalo Field Office[3]**
Northern goshawk (*Accipiter gentiles*)	Conifer and deciduous forests	Yes	Yes	Yes
Peregrine falcon (*Falco peregrinus*)	Cliffs	Yes	Yes	Yes
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	Yes	Yes	Yes
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes	Yes	Yes
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	Yes	Yes	Yes
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	Yes	Yes	Yes
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	Yes	Yes	Yes
Fish				
Bluehead sucker (*Catostomus discobolus*)	Bear, Snake, and Green river drainages, all waters	Yes	Yes	No
Bonneville cutthroat (*Oncorhynchus clarki utah*)	Bear River drainage	Yes	No	No
Colorado cutthroat (*O. clarki pleuriticus*)	Colorado River drainage	Yes	Yes	No
Fine-spotted cutthroat (*O. clarki spp.*)	Snake River drainage	Yes	No	No
Flannelmouth sucker (*Catostomus latipinnis*)	Colorado River drainage, large rivers, streams and lakes	Yes	Yes	No
Leatherside chub (*Gila copei*)	Bear, Snake, and Green river drainages	Yes	No	No

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table E-3.1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued).

Common Name (*scientific name*)	**Habitat**	**Kemmerer Field Office[1]**	**Rawlins Field Office[2]**	**Buffalo Field Office[3]**
Roundtail chub (*Gila robusta*)	Colorado River drainage, mostly large rivers, streams and lakes	Yes	Yes	No
Yellowstone cutthroat (*O. clarki bouvieri*)	Mountain streams and rivers in Yellowstone drainage	No	No	Yes
Mammals				
Dwarf Shrew (*Sorex nanus*)	Mountain foothill shrub, grasslands	Yes	Yes	Yes
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No	Yes	Yes
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	Yes	Yes	Yes
Pocket gopher (*Thomomys spp.*)	Grasslands and shrublands	Yes	Yes	No
Pygmy rabbit (*Brachylagus idahoensis*)	Basin-prairie and riparian shrub	Yes	No	No
Spotted bat (*Euderma maculatum*)	Cliffs over perennial water, basin-prairie shrub	No	No	Yes
Swift fox (*Vulpes velox*)	Grasslands	No	Yes	Yes
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No	Yes	Yes
White-tailed prairie dog (*Cynomys leucurus*)	Basin-prairie shrub, grasslands	Yes	Yes	No

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table E-3.1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued).

Common Name (*scientific name*)	**Habitat**	**Kemmerer Field Office[1]**	**Rawlins Field Office[2]**	**Buffalo Field Office[3]**
Plants				
Beaver Rim phlox (*Phlox pungens*)	Sparsely vegetated slopes on sedimentary substrates; 6,000 to 7,400 ft	Yes	No	No
Cary beardtongue (*Penstemon caryi*)	Calcareous rock outcrops and rocky soil in sage, juniper, Douglas-fir and limber pine communities; 5,200 to 8,500 ft	No	No	Yes
Cedar Rim thistle (*Cirsium aridum*)	Chalky hills, gravelly slopes, & fine textured sandy-shale draws; 6,700 to 7,200 ft	No	Yes	No
Dorn's twinpod (*Physaria dornii*)	Dry, calcareous-shaley soils in mountain mahogany and rabbitbrush communities; 6,500 to 7,200 ft	Yes	No	No
Entire-leaved peppergrass (*Lepidium integrifolium integrifolium*)	Greasewood communities on clay hummocks and moist alkaline meadows; 6,200 to 6,770 ft	Yes	No	No
Gibbens' beardtongue (*Penstemon gibbensii*)	Sparsely vegetated shale or sandy-clay slopes; 5,500 to 7,700 ft	No	Yes	No
Laramie columbine (*Aquilegia laramiensis*)	Crevices in granite; 6,400 to 8,000 ft	No	Yes	No
Laramie false sagebrush (*Sphaeromeria simplex*)	Cushion plant communities on rocky limestone; 7,500 to 8,600 ft	No	Yes	No
Large-fruited bladderpod (*Lesquerella macrocarpa*)	Gypsum-clay hills, benches, and flats; 7,200 to 7,700 ft	Yes	No	No
Nelson's milkvetch (*Astragalus nelsonianus*)	Specialized habitats in sparsely vegetated shrubland and cushion plant communities; 5,200 to 7,600 ft	No	Yes	No
Pale blue-eyed grass (*Sisyrinchium pallidum*)	Wet meadows, streambanks, roadside ditches, and irrigated meadows; 7,000 to 7,900 ft	No	Yes	No

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

Table E-3.1. Bureau of Land Management Sensitive Species, Habitat Requirements, and Occurrence by Field Office (continued).

Common Name (*scientific name*)	**Habitat**	**Kemmerer Field Office[1]**	**Rawlins Field Office[2]**	**Buffalo Field Office[3]**
Persistent sepal yellowcress (*Rorippa calycina*)	Riverbanks and shorelines on sandy soils	No	Yes	No
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300 to 6,500 ft	No	No	Yes
Prostrate bladderpod (*Lesquerella prostrata*)	Sparse communities on slopes and rims of clay & soft sandstones with fine gravel surface; 7,200 to 7,700 ft	Yes	No	No
Trelease's milkvetch (*Astragalus racemosus treleasei*)	Sagebrush communities on shale or limestone outcrops or barren clay slopes; 6,500 to 8,200 ft	Yes	No	No
Tufted twinpod (*Physaria condensata*)	Sparsely vegetated shale slopes and ridges; 6,500 to 7,000 ft	Yes	No	No
Weber's scarlet gilia (*Ipomopsis aggregata weberi*)	Coniferous forest openings and scrub oak woodlands; 8,500 to 9,600 ft	No	Yes	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000 to 8,300 ft	No	No	Yes

[1] Bridger lands to be managed by the Kemmerer Field Office.
[2] JO Ranch lands to be managed by the Rawlins Field Office.
[3] Welch lands to be managed by the Buffalo Field Office and the PSO Tract to be exchanged.

E-4.0 STATE SPECIES OF SPECIAL CONCERN

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

The unsuitability findings for the PSO Tract according to the BLM's1985 and 2001 RMPs are summarized in Appendix C of this EIS. The 1985 findings for Criteria 14 and 15 are discussed in more detail below.

Portions of the PSO Tract totaling about 520 acres were found to be unsuitable for coal leasing and development under Criterion 14 (Habitat for Migratory Birds) when the unsuitability criteria were applied in the early 1980s. The designation was applied due to the presence of important breeding habitat for the Lewis' woodpecker. This species is known to breed in the ponderosa pine habitat in the area of Ash Creek. BLM has reviewed this unsuitability finding and determined that Lewis' woodpeckers have been dropped from the list of "Migratory Non-Game Birds of Management Concern in the U.S." BLM advised USFWS of their intent to drop the unsuitability designation for Lewis' woodpecker habitat under Criterion 14 within this area and to complete a land use plan maintenance action to reflect this. In a letter dated August 20, 2001, USFWS indicated their willingness to concur with the proposed change in unsuitability designation for Criterion 14 and acknowledged that this species has been found to be more widely distributed in Wyoming than when the original designation of unsuitability was applied. The Lewis' woodpecker is not listed within the 2002 USFWS "Migratory Bird Species of Management Concern in Wyoming, Coal Mine List" (USFWS 2002d). However, USFWS requested that the scoria hillsides on the western edge of the exchange area (which contain primary breeding habitat for the woodpeckers) be removed from the exchange. If those areas remain in the exchange tract, the USFWS will require monitoring of the Lewis' woodpecker as part of their mining permit (USFWS 2001b).

The 1985 BLM Buffalo Resource Area RMP found approximately 1,200 acres of federal coal to be unsuitable due to the presence of the Lewis' woodpecker under Criterion 15, Habitat for State High-Interest Species, and some of this acreage overlaps with the western edge of the PSO Tract. The WGFD submitted comments in response to the land exchange notice identifying the Lewis' woodpecker as a state species of special concern that is found in the Ash Creek area in a letter dated January 30, 2001 (WGFD 2001). In their comment letter, WGFD stated that they believe the exchange "will not significantly impact Lewis' woodpeckers, and that any concerns related to the Lewis' woodpecker could be adequately addressed during mine planning if active coal mining is proposed." When contacted, WGFD indicated that, due to the extent of their

occurrence in Wyoming, Lewis' woodpeckers are not considered rare or in need of management emphasis.

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

E-5.0 CREDENTIALS OF SURVEY PERSONNEL

Intermountain Resources of Laramie, Wyoming

Jim Orpet

Mr. Orpet obtained a Master of Science degree in Range Management from the University of Wyoming and has accumulated 24 years of field experience in vegetation and plant surveys. This experience includes preparation of plant species lists for over 100 projects throughout Wyoming. Mr. Orpet was qualified in 1987 by the WDEQ/LQD to conduct T&E species and other plant and animal surveys on WDEQ/Abandoned Mine Land projects within the state. Qualification at that time was based on review and approval of Mr. Orpet's credentials by the WGFD and the USFWS. Mr. Orpet has also completed numerous wetland surveys that have been approved by the U.S. Corps of Engineers.

Russel Tait

Mr. Tait obtained a Bachelor of Science degree in Wildlife Management from the University of Wyoming and has accumulated 11 years of field experience in vegetation and plant surveys in Wyoming. Mr. Tait has assisted Mr. Orpet in conduction of T&E species surveys for over six years on coal mines and other resource development projects in Wyoming.

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APPENDIX F

SPECIFIC RESOURCE INFORMATION
FOR INDIVIDUAL P&M PARCELS WITHIN
THE BRIDGER-TETON NATIONAL FOREST

SPECIFIC RESOURCE INFORMATION FOR INDIVIDUAL P&M PARCELS WITHIN THE BRIDGER-TETON NATIONAL FOREST

East Fork of Hams Fork parcel, approximately 280 acres, located in the Blacks Fork sub-basin. This parcel has over one mile of perennial stream. A Colorado cutthroat trout (sensitive species) fishery exists in this creek. The majority of the parcel is lodgepole pine with some spruce and fir in the forested uplands. Willow and carex dominate the riparian area. The majority of the forested uplands have recently been partially harvested. A significant buffer strip of coniferous trees was left between the harvested area and the creek. It is nearly impossible to see the harvested area through this buffer strip while traveling along the creek. This buffer strip also reduced the likelihood of sediment from the road or from timber harvest activity from entering the creek. There is a single lane road (#10154) passing through this parcel from the northwest corner to the southeast corner. This road provides access to a large area including the headwaters of the East Fork, Pole Creek, and Beaver Creek. Many suitable dispersed camping sites are located within this parcel, primarily along the creek but upland campsites exist as well.

Elk Creek Guard Station parcel, approximately 80 acres, located within the Blacks Fork sub-basin. This parcel is located just southwest of the historic Elk Creek Guard Station cabin. The main stem of the Hams Fork River passes through the northeast corner of this parcel (approximately ¼ mile of the river) Colorado River cutthroat trout are suspected to occupy the streams within this parcel. This parcel contains approximately $^{1}/_{5}$th riparian area, $^{2}/_{5}$th coniferous forest, and $^{2}/_{5}$th open sagebrush/grass vegetation types. Aspen is also a significant component of the vegetation types; it is dispersed within both the coniferous and the sagebrush/grass types. No harvest activity has taken place on this parcel. There has been no other development on this parcel that is known other than a faint trail that passes through the parcel from the West Fork Hams Fork Ridge Road (#10151) northeasterly toward the Elk Creek Guard Station historic cabin. There are remnants of an old access road across National Forest lands from road #10151 to the western side of the parcel. This road has naturally revegetated and is not open to motorized use. This parcel lends itself to non-motorized backcountry camping experience without being very far from a main road system.

Shingle Mill Creek parcel, approximately 240 acres, located within the Blacks Fork sub-basin. This parcel lies between the South Fork of Elk Creek and Sawmill Creek, with the majority of the sub watershed draining into Shingle Mill Creek. Colorado River cutthroat trout are suspected to occupy the streams within this parcel. The majority of this parcel is lodgepole pine, but spruce, fir, and aspen are also present as well as small open patches of sagebrush and grass. There is approximately ½ mile of perennial and ephemeral streams crossing the parcel. The South Fork of Elk Creek bisects the northern most portion, and portions of the Upper Shingle Mill Creek begins within this parcel. There are two access roads, the Shingle Mill Road (#10200) and the North Fork

Sawmill Creek Road (#10158). The Shingle Mill Road accesses the northern portion of the parcel. This road is open seasonally and controlled by a locking gate near the Hams Fork Road (#10062). The North Fork of Sawmill Creek Road accesses the southwestern portion of this parcel. There is no seasonal closure on this road. The forested areas on this parcel have been partially harvested in recent years. There are many opportunities for dispersed camping within this parcel.

North Fork of Elk Creek parcel, approximately 320 acres, within the Blacks Fork sub-basin. This parcel lies between Indian Creek and Elk Creek. Approximately $^{1}/_{10}$ th of a mile of the North Fork of Elk Creek passes through this parcel. Colorado River cutthroat trout are suspected to occupy the streams within this parcel. This parcel consists of a mosaic mix of coniferous forest, mostly lodgepole pine, aspen, and sagebrush/grass. Accessible portions of the lodgepole have been partially harvested. Access to this parcel is via the Elk Creek Road (#10063). This road accesses the northern portion of the parcel and has traditionally been gated closed at the P&M property boundary during the wet periods. The Forest Service Closure is on the east side of the P&M parcel about ¾ road mile to the east. An old jeep trail used to access the southern tip of this parcel via the Shingle Mill Creek Road but this road has been abandoned and reclaimed and is no longer open to motorized use. This parcel has proven to be very productive for elk and deer hunters due to the patchy vegetation and rolling topography. Motorized and non-motorized users could have an outstanding recreational experience here.

Rock Creek parcel, approximately 80 acres within the Blacks Fork sub-basin. This parcel is situated between the Hams Fork River and Middle Ridge. The parcel is primarily on a north-facing slope dominated by lodgepole pine, but with noticeable amounts of spruce, fir, aspen, and a few patches of sagebrush/grass. The forested areas have been partially harvested; an access road was constructed within the parcel. This road has since been closed with earthen berms and with a gated closure. Access to the parcel across National Forest Lands is via road #10198. Due to the north aspect and lack of flat areas and riparian habitat, this parcel would not be expected to be used much by recreational campers although it is likely very valuable for big game hunting and habitat.

Little Indian Creek parcel, approximately 80 acres within the Blacks Fork sub-basin. This parcel is situated just south of Little Indian Creek with a portion ($^{1}/_{8}$ th mile) bisecting the parcel. Colorado River cutthroat trout are suspected to occupy the streams within this parcel. This parcel is mostly forested with a mixed conifer and aspen overstory, sub-alpine fir appears to be the dominant species. No harvest activity has been conducted on this parcel. Access is via the Indian Creek Road (#10161). This parcel is very suitable for dispersed camping, hiking and hunting.

Green Knoll parcel, approximately 560 acres within the Blacks Fork sub-basin. This parcel lies between Middle Ridge and the Hams Fork River. Approximately ¾ mile of the Hams Fork River passes through this parcel. Colorado River cutthroat trout are known to occupy the streams within this parcel. The upland portions consist of a mosaic of coniferous forest, aspen, and sagebrush grass. Approximately half of the forested areas have been partially harvested within the last few years. Several logging roads were created to access the timber; these have mostly been physically closed with earthen berms and downed trees. Access to this parcel is via road #10198. Dispersed camping and hunting opportunities are numerous in this parcel.

Fontenelle Creek / Mahogany Ridge parcel, approximately 800 acres within the Upper Green River sub-basin. This parcel is located along the eastern boundary of the BTNF between Fontenelle Creek and the Fontenelle Hogbacks. Fontenelle Creek and Mahogany Creek pass through this large parcel, totaling approximately 1 mile of stream and associated riparian area. Fontenelle Creek is known to contain Colorado cutthroat trout. This parcel abuts BLM lands outside of the forest boundary in addition to other P&M property that the BLM would acquire under the proposed action. This would create a much more contiguous block of public land in an area that is very critical to wintering wildlife, and heavily used by big game hunters in the fall. Moose, elk, and deer are known to use this area for winter forage. The dominant shrub, curlleaf mountain mahogany is very high in nutrition and the game uses it heavily, especially in harsh winters. This parcel also serves as a major migration corridor for wildlife passing from the forest to the shrub steppe. Mountain lions have been recorded frequenting this parcel as well. Sagebrush/grass, willow, and conifer make up the remainder of the major vegetation types on this parcel. There has been no timber harvest on this parcel and there are no developed trails. Road access to this parcel is limited on the National Forest side (west) but there are some two-track roads accessing the property from private and BLM lands to the east.

APPENDIX G

NON-MINE GROUNDWATER AND
SURFACE WATER RIGHTS
WITHIN THE PSO TRACT

GROUNDWATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P087368W	3/19/1992	T57N	R83W	07	NW NW	WILLIAM G. BARBULA**ARLINE M. BARBU	HITSON #1	UNA	STO	5	230
P118422W	8/19/1999	T57N	R83W	07	NW NW	DOUG/ANNA-JONES CRABTREE	AD #1	UNA	DOM	--	--
P105303W	3/24/1997	T57N	R83W	07	SW NW	JACQUELYN J MORELAND	J.J. #1	UNA	DOM,STO	3	440
P097594W	10/21/1994	T57N	R84W	01	NW SE	GEORGE OR ALICE BAKER	BAKER #2	UNA	DOM	10	160
P063785W	4/21/1983	T57N	R84W	01	NE NW	L. N. & S. A. DAVIS	DAVIS #2		DOM	17	82
P014351W	6/14/1972	T57N	R84W	01	NE NW	BERT STROUP	STROUP #1		DOM,STO	14	220
P034645W	7/30/1976	T57N	R84W	01	NW SE	GEORGE BAKER	BAKER #1		DOM,STO	9	Unknown
P035606W	11/30/1976	T57N	R84W	03	SW SW	FLYING V CATTLE COMPANY	MINE #2		DOM,STO	3	200
P059067W	12/7/1981	T57N	R84W	04	SE NW	CHEVRON USA INC.	MIKE-1		STO	2	200
P074114W	2/26/1987	T57N	R84W	05	NE NW	FLYING V CATTLE COMPANY	FLYING V #7		STO	1	235
P048251W	5/23/1979	T57N	R84W	09	SE NE	FLYING V CATTLE COMPANY	PADLOCK WW (BH429)		STO	5	280
P033064W	5/7/1976	T57N	R84W	09	NW NW	JAY R. HUTTON	HUTTON #1		DOM	8	180
P098281W	2/7/1995	T57N	R84W	10	SE NW	BIG HORN COAL COMPANY	P5 STOCK WELL #1	UNA	STO	5	290
P018702P	12/31/1909	T57N	R84W	11	SE SW	BARBARA CHERNI	BARBARA CHERNI #1		DOM	3	20
P018703P	12/31/1954	T57N	R84W	11	SE SW	BARBARA CHERNI	BARBARA CHERNI #2		DOM	8	12
P018704P	12/31/1954	T57N	R84W	11	SE SW	BARBARA CHERNI	BARBARA CHERNI #3		STO	3	12
P025682P	1/25/1974	T57N	R84W	11	NE SE	CLARENCE W. TERRY	SCHREIBEIS #2		STO	25	40
P025681P	1/25/1974	T57N	R84W	11	SE SE	CLARENCE W. TERRY	SCHREIBEIS #1		DOM	8	210
P095849W	6/20/1994	T57N	R84W	11	SE SE	PETER KIEWIT & SONS, INC	TERRY #2	UNA	DOM	10	140.5
P094647W	3/2/1994	T57N	R84W	12	NE NE	LOREN D. MINEAR	MINEAR #1	UNA	DOM	5	410
P034901W	8/24/1976	T57N	R84W	12	NW NE	GERALD W. MORAVEK	MORAVEK #3	UNA	DOM,STO	5	60
P034902W	8/24/1976	T57N	R84W	12	SW NE	GERALD W. MORAVEK	MORAVEK #4		DOM	3	55
P005493W	5/12/1970	T57N	R84W	12	NE NW	WILLIAM J. EISELE	EISELE #1		STO	1	160
P034899W	8/24/1976	T57N	R84W	12	NE NW	GERALD W. MORAVEK	MORAVEK #1		DOM,STO	9	85
P034900W	8/24/1976	T57N	R84W	12	NE NW	GERALD MORAVEK	MORAVEK #2		DOM,STO	25	10
P018668P	12/31/1935	T57N	R84W	12	SW SE	DEAN MCCLURE	MCCLURE #1 SHERIDAN		DOM,STO	25	200
P018669P	12/31/1935	T57N	R84W	12	SW SE	DEAN MCCLURE	MCCLURE #2 SHERIDAN		STO	10	40
P026850W	5/31/1974	T57N	R84W	12	SW SE	HAROLD L. RILEY	RILEY #1		STO	25	160
P074594W	5/5/1987	T57N	R84W	12	SW SE	ROBERT W. MOREL**SHANE D. MOREL	MOREL S1		DOM,STO	4.5	260
P091876W	6/1/1993	T57N	R84W	14	SE NE	MICHAEL AND SUSAN TERRY	TERRY #1	UNA	DOM,STO	10	34
P002362W	10/7/1968	T57N	R84W	15	SE NE	FLYING V CATTLE COMPANY	COAL PIT #1	ADJ	STO,IRR	2700	87
P111433W	8/17/1998	T58N	R83W	19	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41D1-1983	GST	STO,CBM	25	422
P127442W	7/7/2000	T58N	R83W	19	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41C-1983	GST	STO,CBM	25	784
P127443W	7/7/2000	T58N	R83W	19	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41D2/3-1983	GST	STO,CBM	25	482
P127444W	7/7/2000	T58N	R83W	19	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41M-1983	GST	STO,CBM	25	607.5
P111432W	8/17/1998	T58N	R83W	19	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32C-1983	GST	STO,CBM	25	863
P127435W	7/7/2000	T58N	R83W	19	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32D1-1983	GST	STO,CBM	25	400
P127436W	7/7/2000	T58N	R83W	19	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32D2/3-1983	GST	STO,CBM	25	561
P127437W	7/7/2000	T58N	R83W	19	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32M-1983	GST	STO,CBM	25	681
P127427W	7/7/2000	T58N	R83W	19	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21C-1983	GST	STO,CBM	25	857
P127428W	7/7/2000	T58N	R83W	19	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21D1-1983	GST	STO,CBM	25	569.5
P127430W	7/7/2000	T58N	R83W	19	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21M-1983	GST	STO,CBM	25	684
P130412W	10/23/2000	T58N	R83W	19	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12C-1983	GSI	STO,CBM	--	--
P130413W	10/23/2000	T58N	R83W	19	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 12D1-1983	GSI	STO,CBM	--	--
P130414W	10/23/2000	T58N	R83W	19	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 12D2/3-1983	GSI	STO,CBM	--	--

GROUNDWATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P130415W	10/23/2000	T58N	R83W	19	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 12M-1983	GSI	STO,CBM	--	--
P140343W	10/4/2001	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL.CHEVRON 34C-1983	GST	IRR,CBM	0	710
P140344W	10/4/2001	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 34D1-1983	GST	IRR,CBM	0	234.5
P140345W	10/4/2001	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 34D2/3-1983	GST	IRR,CBM	0	426
P140346W	10/4/2001	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 34M-1983	GST	IRR,CBM	0	553
P030374W	6/30/1975	T58N	R83W	19	SW SE	CHEVRON USA INC.	BT #5		STO	5	280
P032672W	4/1/1976	T58N	R83W	19	SW SE	CHEVRON USA INC.	BT 10		STO	8	277
P127445W	7/7/2000	T58N	R83W	19	NE SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 43C-1983	GST	STO,CBM	25	725
P127446W	7/7/2000	T58N	R83W	19	NE SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 43D1-1983	GST	STO,CBM	25	293.5
P127447W	7/7/2000	T58N	R83W	19	NE SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 43D2/3-1983	GST	STO,CBM	25	430
P132474W	1/22/2001	T58N	R83W	19	NE SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 43M-1983	GST	STO,CBM	25	764
P127438W	7/7/2000	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34C-1983	GST	STO,CBM	25	710
P127439W	7/7/2000	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34D1-1983	GST	STO,CBM	25	234.5
P127440W	7/7/2000	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34D2/3-1983	GST	STO,CBM	25	426
P127441W	7/7/2000	T58N	R83W	19	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34M-1983	GST	STO,CBM	25	553
P140999W	10/4/2001	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 14C-1983	GSI	IRR,CBM	--	--
P141000W	10/4/2001	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 14D1-1983	GSI	IRR,CBM	--	--
P141001W	10/4/2001	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 14D2/3-1983	GSI	IRR,CBM	--	--
P141002W	10/4/2001	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 14M-1983	GSI	IRR,CBM	--	--
P127431W	7/7/2000	T58N	R83W	19	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23C-1983	GST	STO,CBM	25	658
P127432W	7/7/2000	T58N	R83W	19	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23D1-1983	GST	STO,CBM	25	264
P127433W	7/7/2000	T58N	R83W	19	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23D2/3-1983	GST	STO,CBM	25	408.5
P127434W	7/7/2000	T58N	R83W	19	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23M-1983	GST	STO,CBM	25	527
P130416W	10/23/2000	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 14C-1983	GSI	STO,CBM	--	--
P130417W	10/23/2000	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 14D1-1983	GSI	STO,CBM	--	--
P130418W	10/23/2000	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 14D2/3-1983	GSI	STO,CBM	--	--
P130419W	10/23/2000	T58N	R83W	19	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON FED 14M-1983	GSI	STO,CBM	--	--
P128037W	7/31/2000	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21C-2083	GST	STO,CBM	25	622
P128038W	7/31/2000	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21D1-2083	GST	STO,CBM	25	189.5
P128039W	7/31/2000	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21D2/3-2083	GST	STO,CBM	25	372.5
P128040W	7/31/2000	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21M-2083	GST	STO,CBM	25	494
P140351W	10/4/2001	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 21C-2083	GST	IRR,CBM	0	622
P140352W	10/4/2001	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 21D1-2083	GST	IRR,CBM	0	189.5
P140353W	10/4/2001	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 21M-2083	GST	IRR,CBM	0	372.5
P140354W	10/4/2001	T58N	R83W	20	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 21D2/3-2083	GST	IRR,CBM	0	494
P128029W	7/31/2000	T58N	R83W	20	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12M-2083	GST	STO,CBM	25	742
P128030W	7/31/2000	T58N	R83W	20	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12D1-2083	GST	STO,CBM	25	257
P128031W	7/31/2000	T58N	R83W	20	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12D2/3-2083	GST	STO,CBM	25	397.5
P128032W	7/31/2000	T58N	R83W	20	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12C-2083	GST	STO,CBM	25	681
P128041W	7/31/2000	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23C-2083	GST	STO,CBM	25	599
P128042W	7/31/2000	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23D1-2083	GST	STO,CBM	25	155.5
P128043W	7/31/2000	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23D2/3-2083	GST	STO,CBM	25	347
P128044W	7/31/2000	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23M-2083	GST	STO,CBM	25	470.5
P140355W	10/4/2001	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23C-2083	GST	IRR,CBM	0	599
P140356W	10/4/2001	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23D1-2083	GST	IRR,CBM	0	155.5
P140357W	10/4/2001	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23D2-2083	GST	IRR,CBM	0	347

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P140358W	10/4/2001	T58N	R83W	20	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23M-2083	GST	IRR,CBM	0	470.5
P128033W	7/31/2000	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 14C-2083	GST	STO,CBM	25	650.5
P128034W	7/31/2000	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 14D1-2083	GST	STO,CBM	25	152
P128035W	7/31/2000	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 14D2/3-2083	GST	STO,CBM	25	343
P128036W	7/31/2000	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 14M-2083	GST	STO,CBM	25	465.5
P140347W	10/4/2001	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 14C-2083	GST	IRR,CBM	0	650.5
P140348W	10/4/2001	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 14D1-2083	GST	IRR,CBM	0	152
P140349W	10/4/2001	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 14D2/3-2083	GST	IRR,CBM	0	343
P140350W	10/4/2001	T58N	R83W	20	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 14M-2083	GST	IRR,CBM	0	465.5
P134551W	4/30/2001	T58N	R83W	29	NE NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 21C-2983	GSI	STO,CBM	--	--
P134552W	4/30/2001	T58N	R83W	29	NE NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 21D1-2983	GSI	STO,CBM	--	--
P134553W	4/30/2001	T58N	R83W	29	NE NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 21D3-2983	GSI	STO,CBM	--	--
P134554W	4/30/2001	T58N	R83W	29	NE NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 21M-2983	GSI	STO,CBM	--	--
P141155W	12/3/2001	T58N	R83W	29	NE NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 21D2-2983	GSI	STO,CBM	--	--
P134543W	4/30/2001	T58N	R83W	29	SW NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 12 C-2983	GST	STO,CBM	25	644
P134544W	4/30/2001	T58N	R83W	29	SW NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 12 D1-2983	GST	STO,CBM	25	183
P134545W	4/30/2001	T58N	R83W	29	SW NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 12 D3-2983	GST	STO,CBM	25	346.5
P134546W	4/30/2001	T58N	R83W	29	SW NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 12 M-2983	GST	STO,CBM	25	459
P141160W	12/3/2001	T58N	R83W	29	SW NW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 12D2-2983	GSI	STO,CBM	--	--
P134555W	4/30/2001	T58N	R83W	29	NE SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 23C-2983	GST	STO,CBM	25	683
P134556W	4/30/2001	T58N	R83W	29	NE SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 23D1-2983	GSI	STO,CBM	--	--
P134557W	4/30/2001	T58N	R83W	29	NE SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 23D3-2983	GSI	STO,CBM	--	--
P134558W	4/30/2001	T58N	R83W	29	NE SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 23M-2983	GST	STO,CBM	25	503
P141159W	12/3/2001	T58N	R83W	29	NE SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 23D2-2983	GSI	STO,CBM	--	--
P134547W	4/30/2001	T58N	R83W	29	SW SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 14C-2983	GSI	STO,CBM	--	--
P134548W	4/30/2001	T58N	R83W	29	SW SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 14D1-2983	GSI	STO,CBM	--	--
P134549W	4/30/2001	T58N	R83W	29	SW SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 14D3-2983	GSI	STO,CBM	--	--
P134550W	4/30/2001	T58N	R83W	29	SW SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 14M-2983	GSI	STO,CBM	--	--
P141157W	12/3/2001	T58N	R83W	29	SW SW	FIDELITY EXPLORATION & PRODUCTION	DUNNING 14D2-2983	GSI	STO,CBM	--	--
P112488W	10/28/1998	T58N	R83W	30	NE NE	FOREST/SUSAN DUNNING	DUNNING HOME #1	UNA	DOM	8	40
P134559W	4/30/2001	T58N	R83W	30	NE NE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 41C-3083	GSI	STO,CBM	--	--
P134560W	4/30/2001	T58N	R83W	30	NE NE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 41D1-3083	GSI	STO,CBM	--	--
P134561W	4/30/2001	T58N	R83W	30	NE NE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 41D3-3083	GSI	STO,CBM	--	--
P134562W	4/30/2001	T58N	R83W	30	NE NE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 41M-3083	GSI	STO,CBM	--	--
P141158W	12/3/2001	T58N	R83W	30	NE NE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 41D2-3083	GSI	STO,CBM	--	--
P030371W	6/30/1975	T58N	R83W	30	SW NE	FORT UNION LTD.	BT #2	UNA	DOM,STO	5	15
P116932W	7/11/1999	T58N	R83W	30	SW NE	THE PITSBURG & MIDWAY COAL MINING	P & M #1	UNA	DOM,STO	20	38
P130265W	8/1/2000	T58N	R83W	30	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32C-3083	GST	STO,CBM	25	642
P130266W	8/1/2000	T58N	R83W	30	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32D2/3-3083	GST	STO,CBM	25	349
P130267W	8/1/2000	T58N	R83W	30	SW NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 32M-3083	GST	STO,CBM	25	480
P140371W	10/4/2001	T58N	R83W	30	SW NE	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 32C-3083	GST	IRR,CBM	0	642
P140372W	10/4/2001	T58N	R83W	30	SW NE	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 32D3-3083	GST	IRR,CBM	0	349
P140373W	10/4/2001	T58N	R83W	30	SW NE	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 32M-3083	GST	IRR,CBM	0	480
P134414W	5/7/2001	T58N	R83W	30	SE NE	FOREST DUNNING	DUNNING 42WW-3083	GST	DOM	17	255
P130260W	8/1/2000	T58N	R83W	30	NE NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21M-3083	GST	STO,CBM	25	494.5
P140995W	10/4/2001	T58N	R83W	30	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 21C-3083	GST	IRR,CBM	0	656.5

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P140996W	10/4/2001	T58N	R83W	30	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 21D1-3083	GST	IRR,CBM	0	217
P140997W	10/4/2001	T58N	R83W	30	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 21D2/3-3083	GST	IRR,CBM	0	380
P140998W	10/4/2001	T58N	R83W	30	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 21M-3083	GST	IRR,CBM	0	494.5
P128415W	8/21/2000	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12C-3083	GST	STO,CBM	25	618
P128416W	8/21/2000	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12D2/3-3083	GST	STO,CBM	25	328.5
P128417W	8/21/2000	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 12M-3083	GST	STO,CBM	25	446
P130257W	8/1/2000	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21C-3083	GST	STO,CBM	25	656.5
P130258W	8/1/2000	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21D1-3083	GST	STO,CBM	25	217
P130259W	8/1/2000	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 21D2/3-3083	GST	STO,CBM	25	380
P140992W	10/4/2001	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 12C-3083	GST	IRR,CBM	0	618
P140993W	10/4/2001	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 12D2/3-3083	GST	IRR,CBM	0	328.5
P140994W	10/4/2001	T58N	R83W	30	SW NW	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 12M-3083	GST	IRR,CBM	0	446
P130261W	8/1/2000	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23C-3083	GST	STO,CBM	25	620.5
P130262W	8/1/2000	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23D1-3083	GST	STO,CBM	25	128
P130263W	8/1/2000	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23D3-3083	GST	STO,CBM	25	340.5
P130264W	8/1/2000	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 23M-3083	GST	STO,CBM	25	448
P140367W	10/4/2001	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23C-3083	GST	IRR,CBM	0	620.5
P140368W	10/4/2001	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23D1-3083	GST	IRR,CBM	0	128
P140369W	10/4/2001	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23D3-3083	GST	IRR,CBM	0	340.5
P140370W	10/4/2001	T58N	R83W	30	NE SW	FIDELITY EXPLORATION & PRODUCTION	ENL. CHEVRON 23M-3083	GST	IRR,CBM	0	448
P112487W	10/28/1998	T58N	R83W	30	NE SE	FOREST/SUSAN DUNNING	DUNNING BARN #1	UNA	DOM,STO	16	40
P124878W	4/17/2000	T58N	R83W	30	NE SE	FOREST/SUSAN DUNNING	DUNNING HOME #2	GST	DOM,STO	25	43
P134563W	4/30/2001	T58N	R83W	30	NE SE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 43C-3083	GSI	STO,CBM	--	--
P134564W	4/30/2001	T58N	R83W	30	NE SE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 43D1-3083	GSI	STO,CBM	--	--
P134565W	4/30/2001	T58N	R83W	30	NE SE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 43D3-3083	GSI	STO,CBM	--	--
P134566W	4/30/2001	T58N	R83W	30	NE SE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 43M-3083	GSI	STO,CBM	--	--
P141156W	12/3/2001	T58N	R83W	30	NE SE	FIDELITY EXPLORATION & PRODUCTION	DUNNING 43D2-3083	GSI	STO,CBM	--	--
P130268W	8/1/2000	T58N	R83W	30	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34C-3083	GST	STO,CBM	25	595
P130269W	8/1/2000	T58N	R83W	30	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34D1-3083	GST	STO,CBM	25	95
P130270W	8/1/2000	T58N	R83W	30	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34D2/3-3083	GST	STO,CBM	25	337
P130271W	8/1/2000	T58N	R83W	30	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34M-3083	GST	STO,CBM	25	464.5
P136648W	7/2/2001	T58N	R83W	31	NE SW	J M HUBER CORPORATION	DUNNING 9-31 58-83	GSI	CBM	--	--
P136649W	7/2/2001	T58N	R83W	31	NE SW	J M HUBER CORPORATION	DUNNING 9D-31 58-83	GSI	CBM	--	--
P136650W	7/2/2001	T58N	R83W	31	NE SW	J M HUBER CORPORATION	DUNNING 9 M-31 58-83	GSI	CBM	--	--
P140533W	10/31/2001	T58N	R83W	31	SW SE	J M HUBER CORPORATION	ANKNEY 15-31 58-83	GSI	CBM	--	--
P140534W	10/31/2001	T58N	R83W	31	SW SE	J M HUBER CORPORATION	ANKNEY 15A-31 58-83	GSI	CBM	--	--
P140535W	10/31/2001	T58N	R83W	31	SW SE	J M HUBER CORPORATION	ANKNEY 15D3-31 58-83	GSI	CBM	--	--
P140536W	10/31/2001	T58N	R83W	31	NE SW	J M HUBER CORPORATION	ANKNEY 11M-31 58-83	GSI	CBM	--	--
P140537W	10/31/2001	T58N	R83W	31	NE SW	J M HUBER CORPORATION	ANKNEY 11-31 58-83	GSI	CBM	--	--
P140538W	10/31/2001	T58N	R83W	31	NE SW	J M HUBER CORPORATION	ANKNEY 11D3-31 58-83	GSI	CBM	--	--
P142317W	1/29/2002	T58N	R83W	31	SW NE	J M HUBER CORPORATION	ANKNEY 7D3-31 58-83	GSI	CBM	--	--
P142318W	1/29/2002	T58N	R83W	31	SW NE	J M HUBER CORPORATION	ANKNEY 7-31 58-83	GSI	CBM	--	--
P142319W	1/29/2002	T58N	R83W	31	SW SE	J M HUBER CORPORATION	ANKNEY 15M-31 58-83	GSI	CBM	--	--
P144217W	4/15/2002	T58N	R83W	31	SW SW	J M HUBER CORPORATION	DELAPP 13M-31 58-83	GSI	CBM	--	--
P144218W	4/15/2002	T58N	R83W	31	SW SW	J M HUBER CORPORATION	DELAPP 13K-31 58-83	GSI	CBM	--	--
P144219W	4/15/2002	T58N	R83W	31	SW SW	J M HUBER CORPORATION	DELAPP 13D-31 58-83	GSI	CBM	--	--

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P144220W	4/15/2002	T58N	R83W	31	SW NW	J M HUBER CORPORATION	DELAPP 5K-31 58-83	GSI	CBM	--	--
P144221W	4/15/2002	T58N	R83W	31	SW NW	J M HUBER CORPORATION	DELAPP 5M-31 58-83	GSI	CBM	--	--
P144222W	4/15/2002	T58N	R83W	31	SW NW	J M HUBER CORPORATION	DELAPP 5D-31 58-83	GSI	CBM	--	--
P144226W	4/15/2002	T58N	R83W	31	NE NE	J M HUBER CORPORATION	ANKNEY 1-31 58-83	GSI	CBM	--	--
P144227W	4/15/2002	T58N	R83W	31	NE NE	J M HUBER CORPORATION	ANKNEY 1D-31 58-83	GSI	CBM	--	--
P016948P	7/20/1960	T58N	R84W	19	NE SE	J. VERNON STATES	BAKER #1		STO	3	Unknown
P143468W	3/18/2002	T58N	R84W	20	NE NW	J M HUBER CORPORATION	CHEVRON 3M-20 58-84	GSI	CBM	--	--
P143469W	3/18/2002	T58N	R84W	20	NE NW	J M HUBER CORPORATION	CHEVRON 3K-20 58-84	GSI	CBM	--	--
P143463W	3/18/2002	T58N	R84W	20	SW NW	J M HUBER CORPORATION	CHEVRON 5K-20 58-84	GSI	CBM	--	--
P143467W	3/18/2002	T58N	R84W	20	SW NW	J M HUBER CORPORATION	CHEVRON 5M-20 58-84	GSI	CBM	--	--
P016946P	8/25/1958	T58N	R84W	20	SE NW	J. VERNON STATES	BOB. HERLAND #1		STO	25	3
P143466W	3/18/2002	T58N	R84W	20	NE SW	J M HUBER CORPORATION	CHEVRON 11K-20 58-84	GSI	CBM	--	--
P143464W	3/18/2002	T58N	R84W	20	SW SE	J M HUBER CORPORATION	CHEVRON 15M-20 58-84	GSI	CBM	--	--
P143465W	3/18/2002	T58N	R84W	20	SW SE	J M HUBER CORPORATION	CHEVRON 15K-20 58-84	GSI	CBM	--	--
P143462W	3/18/2002	T58N	R84W	22	NE SW	J M HUBER CORPORATION	CHEVRON 11M-20 58-84	GSI	CBM	--	--
P127904W	8/3/2000	T58N	R84W	22	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43C-2284	GST	STO,CBM	25	429
P127905W	8/3/2000	T58N	R84W	22	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43M-2284	GST	STO,CBM	25	299
P127902W	8/3/2000	T58N	R84W	22	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34C-2284	GST	STO,CBM	25	437
P127903W	8/3/2000	T58N	R84W	22	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34M-2284	GST	STO,CBM	25	284
P125340W	5/5/2000	T58N	R84W	23	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41M-2384	GST	STO,CBM	25	358.5
P125342W	5/5/2000	T58N	R84W	23	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41M-2384	GST	STO,CBM	25	477
P126823W	7/3/2000	T58N	R84W	23	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32C-2384	GST	STO,CBM	25	394
P126824W	7/3/2000	T58N	R84W	23	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32D2/3-2384	GST	STO,CBM	25	166
P126825W	7/3/2000	T58N	R84W	23	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32M-2384	GST	STO,CBM	25	305
P140976W	10/4/2001	T58N	R84W	23	SW NE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 32C-2384	GST	IRR,CBM	0	394
P140977W	10/4/2001	T58N	R84W	23	SW NE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 32D-2384	GST	IRR,CBM	0	166
P140978W	10/4/2001	T58N	R84W	23	SW NE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 32M-2384	GST	IRR,CBM	0	305
P125334W	5/5/2000	T58N	R84W	23	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21C-2384	UNA	STO,CBM	25	594.5
P125335W	5/5/2000	T58N	R84W	23	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21D2/3-2384	GST	STO,CBM	25	369
P125336W	5/5/2000	T58N	R84W	23	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21M-2384	UNA	STO,CBM	--	--
P125328W	5/5/2000	T58N	R84W	23	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12C-2384	UNA	STO,CBM	25	458.6
P125329W	5/5/2000	T58N	R84W	23	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12D2/3-2384	GST	STO,CBM	25	196
P125330W	5/5/2000	T58N	R84W	23	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12M-2384	GST	STO,CBM	25	324
P126820W	7/3/2000	T58N	R84W	23	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23C-2384	GST	STO,CBM	25	379
P126822W	7/3/2000	T58N	R84W	23	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23M-2384	GST	STO,CBM	25	276
P125331W	5/5/2000	T58N	R84W	23	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14C-2384	GST	STO,CBM	25	744
P125332W	5/5/2000	T58N	R84W	23	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14D2/3-2384	GST	STO,CBM	25	122
P125333W	5/5/2000	T58N	R84W	23	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14M-2384	GST	STO,CBM	25	294
P125343W	5/5/2000	T58N	R84W	23	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D2/3-2384	GST	STO,CBM	25	1147
P126826W	7/3/2000	T58N	R84W	23	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D1-2384	GST	STO,CBM	25	422
P125337W	5/5/2000	T58N	R84W	23	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34C-2384	GST	STO,CBM	25	750
P125338W	5/5/2000	T58N	R84W	23	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34D2/3-2384	GST	STO,CBM	25	481
P125339W	5/5/2000	T58N	R84W	23	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34M-2384	GST	STO,CBM	25	636
P126844W	7/3/2000	T58N	R84W	24	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41C-2484	GST	STO,CBM	25	973.5
P126846W	7/3/2000	T58N	R84W	24	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41D2/3-2484	GST	STO,CBM	25	689.5
P126847W	7/3/2000	T58N	R84W	24	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41M-2484	GST	STO,CBM	25	814.5

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P126839W	7/3/2000	T58N	R84W	24	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32C-2484	GST	STO,CBM	25	1016
P126840W	7/3/2000	T58N	R84W	24	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32D-2484	GST	STO,CBM	25	666.5
P126841W	7/3/2000	T58N	R84W	24	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32M-2484	GSI	STO,CBM	--	--
P126833W	7/3/2000	T58N	R84W	24	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21C-2484	UNA	STO,CBM	25	510
P126834W	7/3/2000	T58N	R84W	24	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21D-2484	GST	STO,CBM	25	259
P126835W	7/3/2000	T58N	R84W	24	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21M-2484	GST	STO,CBM	25	354
P126827W	7/3/2000	T58N	R84W	24	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12C-2484	GSI	STO,CBM	--	--
P126828W	7/3/2000	T58N	R84W	24	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12C-2484	GST	STO,CBM	25	500
P126836W	7/3/2000	T58N	R84W	24	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23C-2484	GST	STO,CBM	25	787
P126837W	7/3/2000	T58N	R84W	24	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23D2/3-2484	GST	STO,CBM	25	536
P126838W	7/3/2000	T58N	R84W	24	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23M-2484	GST	STO,CBM	25	645
P126829W	7/3/2000	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14C-2484	GST	STO,CBM	25	681
P126830W	7/3/2000	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14D1-2484	GSI	STO,CBM	--	--
P126831W	7/3/2000	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14D2/3-2484	GST	STO,CBM	25	419
P126832W	7/3/2000	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14M-2484	GST	STO,CBM	25	549
P140979W	10/4/2001	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 14C-2484	GST	IRR,CBM	0	681
P140980W	10/4/2001	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14D1-2484	GST	IRR,CBM	0	--
P140981W	10/4/2001	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 14D2/3-2484	GST	IRR,CBM	0	419
P140982W	10/4/2001	T58N	R84W	24	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 14M-2484	GST	IRR,CBM	0	549
P126848W	7/3/2000	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43C-2484	GST	STO,CBM	25	723
P126849W	7/3/2000	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D1-2484	GST	STO,CBM	25	330
P126850W	7/3/2000	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D2/3-2484	GST	STO,CBM	25	432
P126851W	7/3/2000	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43M-2484	GST	STO,CBM	25	540
P140985W	10/4/2001	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43C-2484	GST	IRR,CBM	0	723
P140986W	10/4/2001	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D1-2484	GST	IRR,CBM	0	330
P140987W	10/4/2001	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43D2/3-2484	GST	IRR,CBM	0	432
P140988W	10/4/2001	T58N	R84W	24	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43M-2484	GST	IRR,CBM	0	540
P126842W	7/3/2000	T58N	R84W	24	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34C-2484	GST	STO,CBM	25	666
P126843W	7/3/2000	T58N	R84W	24	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34M-2484	GSI	STO,CBM	--	--
P126856W	7/3/2000	T58N	R84W	24	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34D2/3-2484	GST	STO,CBM	25	319
P140983W	10/4/2001	T58N	R84W	24	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 34C-2484	GST	IRR,CBM	0	666
P140984W	10/4/2001	T58N	R84W	24	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 34M-2484	GST	IRR,CBM	--	--
P140991W	10/4/2001	T58N	R84W	24	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 34D2/3-2484	GST	IRR,CBM	0	319
P123715W	2/24/2000	T58N	R84W	25	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41C-2584	GST	STO,CBM	25	584
P123716W	2/24/2000	T58N	R84W	25	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41D2/3-2584	GST	STO,CBM	25	334
P123717W	2/24/2000	T58N	R84W	25	NE NE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 41M-2584	GST	STO,CBM	25	436
P140967W	10/4/2001	T58N	R84W	25	NE NE	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 41C-2584	GST	IRR,CBM	0	584
P140968W	10/4/2001	T58N	R84W	25	NE NE	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 41D2/3-2584	GST	IRR,CBM	0	334
P140969W	10/4/2001	T58N	R84W	25	NE NE	FIDELITY EXPLORATION & PRODUCTION	ENL CHEVRON 41M-2584	GST	IRR,CBM	0	436
P123709W	2/24/2000	T58N	R84W	25	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32C-2584	UNA	STO,CBM	25	608
P123710W	2/24/2000	T58N	R84W	25	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32D2/3-2584	UNA	STO,CBM	25	314
P123711W	2/24/2000	T58N	R84W	25	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32M-2584	UNA	STO,CBM	25	418
P126853W	7/3/2000	T58N	R84W	25	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32D1-2584	GSI	STO,CBM	--	--
P123703W	2/24/2000	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21C-2584	GST	STO,CBM	25	587
P123704W	2/24/2000	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21D2/3-2584	GST	STO,CBM	25	315
P123705W	2/24/2000	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21M-2584	GST	STO,CBM	25	425.5

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P126852W	7/3/2000	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21D1-2584	GSI	STO,CBM	--	--
P140961W	10/4/2001	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 21C-2584	GST	IRR,CBM	0	587
P140962W	10/4/2001	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 21D2/3-2584	GST	IRR,CBM	0	315
P140963W	10/4/2001	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 21M-2584	GST	IRR,CBM	0	425.5
P140989W	10/4/2001	T58N	R84W	25	NE NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 21D1-2584	GSI	IRR,CBM	--	--
P123697W	2/24/2000	T58N	R84W	25	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12C-2584	GST	STO,CBM	25	648
P123698W	2/24/2000	T58N	R84W	25	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12D2/3-2584	UNA	STO,CBM	25	369
P123699W	2/24/2000	T58N	R84W	25	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12M-2584	UNA	STO,CBM	25	499
P140955W	10/4/2001	T58N	R84W	25	SW NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 12C-2584	GST	IRR,CBM	0	648
P140956W	10/4/2001	T58N	R84W	25	SW NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 12D2/3-2584	GST	IRR,CBM	0	369
P140957W	10/4/2001	T58N	R84W	25	SW NW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 12M-2584	GST	IRR,CBM	0	499
P123706W	2/24/2000	T58N	R84W	25	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23C-2584	UNA	STO,CBM	25	632
P123707W	2/24/2000	T58N	R84W	25	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23D2/3-2584	UNA	STO,CBM	25	370.5
P123708W	2/24/2000	T58N	R84W	25	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23M-2584	UNA	STO,CBM	25	496
P123700W	2/24/2000	T58N	R84W	25	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14C-2584	GST	STO,CBM	25	598.5
P123701W	2/24/2000	T58N	R84W	25	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14D2/3-2584	GST	STO,CBM	25	323
P123702W	2/24/2000	T58N	R84W	25	SW SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 14M-2584	GST	STO,CBM	25	448
P140958W	10/4/2001	T58N	R84W	25	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 14C-2584	GST	IRR,CBM	0	598.5
P140959W	10/4/2001	T58N	R84W	25	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 14D23-2584	GST	IRR,CBM	0	323
P140960W	10/4/2001	T58N	R84W	25	SW SW	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 14M-2584	GST	IRR,CBM	0	448
P123718W	2/24/2000	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43C-2584	GST	STO,CBM	25	654
P123719W	2/24/2000	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D2/3-2584	GST	STO,CBM	--	--
P123720W	2/24/2000	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43M-2584	GST	STO,CBM	25	471
P126854W	7/3/2000	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 43D1-2584	GSI	STO,CBM	--	--
P140970W	10/4/2001	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43C-2584	GST	IRR,CBM	0	654
P140971W	10/4/2001	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43D2/3-2584	GST	IRR,CBM	0	364
P140972W	10/4/2001	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43M-2584	GST	IRR,CBM	0	471
P140990W	10/4/2001	T58N	R84W	25	NE SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 43D1-2584	GSI	IRR,CBM	--	--
P123712W	2/24/2000	T58N	R84W	25	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34C-2584	GST	STO,CBM	25	733
P123713W	2/24/2000	T58N	R84W	25	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34D2/3-2584	GST	STO,CBM	25	382.5
P123714W	2/24/2000	T58N	R84W	25	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34M-2584	GST	STO,CBM	25	501
P140964W	10/4/2001	T58N	R84W	25	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 34C-2584	GST	IRR,CBM	0	733
P140965W	10/4/2001	T58N	R84W	25	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 34D2/3-2584	GST	IRR,CBM	0	382.5
P140966W	10/4/2001	T58N	R84W	25	SW SE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 34M-2584	GST	IRR,CBM	0	501
P123733W	2/24/2000	T58N	R84W	26	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41C-2684	GST	STO,CBM	25	618
P123734W	2/24/2000	T58N	R84W	26	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41D2/3-2684	GST	STO,CBM	25	354.5
P123735W	2/24/2000	T58N	R84W	26	NE NE	REDSTONE GAS PARTNERS LLC	RESERVE 41M-2684	GST	STO,CBM	25	479
P140973W	10/4/2001	T58N	R84W	26	NE NE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 41C-2684	GST	IRR,CBM	0	618
P140974W	10/4/2001	T58N	R84W	26	NE NE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 41D2/3-2684	GST	IRR,CBM	0	354.5
P140975W	10/4/2001	T58N	R84W	26	NE NE	FIDELITY EXPLORATION & PRODUCTION	ENL RESERVE 41M-2684	GST	IRR,CBM	0	479
P123727W	2/24/2000	T58N	R84W	26	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32C-2684	UNA	STO,CBM	25	687
P123728W	2/24/2000	T58N	R84W	26	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32D2/3-2684	UNA	STO,CBM	25	427.5
P123729W	2/24/2000	T58N	R84W	26	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32M-2684	UNA	STO,CBM	25	582.5
P125978W	5/23/2000	T58N	R84W	26	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21M-2684	UNA	STO,CBM	25	521
P125979W	5/23/2000	T58N	R84W	26	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21D2/3-2684	GST	STO,CBM	25	361
P125980W	5/23/2000	T58N	R84W	26	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 21C-2684	UNA	STO,CBM	25	605.5

GROUNDWATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P125981W	5/23/2000	T58N	R84W	26	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12M-2684	UNA	STO,CBM	25	492
P125987W	5/23/2000	T58N	R84W	26	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12C-2684	UNA	STO,CBM	25	593
P125988W	5/23/2000	T58N	R84W	26	SW NW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 12D2/3-2684	UNA	STO,CBM	25	356
P123724W	2/24/2000	T58N	R84W	26	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23C-2684	UNA	STO,CBM	25	495
P123725W	2/24/2000	T58N	R84W	26	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23D2/3-2684	UNA	STO,CBM	25	231
P123726W	2/24/2000	T58N	R84W	26	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23M-2684	UNA	STO,CBM	25	358
P134600W	4/24/2001	T58N	R84W	26	NE SW	J. M. HUBER CORPORATION	TREMBATH 11D3-26 5883	GSI	STO,MIS,CBM	--	--
P123721W	2/24/2000	T58N	R84W	26	SW SW	FIDELITY EXPLORATION & PRODUCTION	SHELL 14C-2684	GST	STO,CBM	25	419.5
P123722W	2/24/2000	T58N	R84W	26	SW SW	FIDELITY EXPLORATION & PRODUCTION	SHELL 14D2/3-2684	GST	STO,CBM	25	189.5
P123723W	2/24/2000	T58N	R84W	26	SW SW	FIDELITY EXPLORATION & PRODUCTION	SHELL 14M-2684	GST	STO,CBM	25	300
P134602W	4/24/2001	T58N	R84W	26	NE SE	J. M. HUBER CORPORATION	TREMBATH 9D3-26 5883	GSI	STO,MIS,CBM	--	--
P123730W	2/24/2000	T58N	R84W	26	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34C-2684	UNA	STO,CBM	25	457
P123731W	2/24/2000	T58N	R84W	26	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34D2/3-2684	UNA	STO,CBM	25	199.5
P123732W	2/24/2000	T58N	R84W	26	SW SE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 34M-2684	UNA	STO,CBM	25	299.5
P134601W	4/24/2001	T58N	R84W	26	SW SE	J. M. HUBER CORPORATION	TREMBATH 15D3-26 5883	GST	STO,MIS,CBM	12.32	491
P123746W	2/24/2000	T58N	R84W	27	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41D2/3-2784	UNA	STO,CBM	25	408
P123747W	2/24/2000	T58N	R84W	27	NE NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 41M-2784	UNA	STO,CBM	25	546
P123739W	2/24/2000	T58N	R84W	27	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32C-2784	UNA	STO,CBM	25	590
P123740W	2/24/2000	T58N	R84W	27	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32D2/3-2784	UNA	STO,CBM	25	327.5
P123741W	2/24/2000	T58N	R84W	27	SW NE	FIDELITY EXPLORATION & PRODUCTION	RESERVE 32M-2784	UNA	STO,CBM	25	451.5
P123736W	2/24/2000	T58N	R84W	27	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23C-2784	UNA	STO,CBM	25	422
P123738W	2/24/2000	T58N	R84W	27	NE SW	FIDELITY EXPLORATION & PRODUCTION	RESERVE 23M-2784	UNA	STO,CBM	25	290
P130516W	10/24/2000	T58N	R84W	27	SW SW	FIDELITY EXPLORATION & PRODUCTION	DELAPP 14C-2784	GSI	STO,CBM	--	--
P123748W	2/24/2000	T58N	R84W	27	NE SE	FIDELITY EXPLORATION & PRODUCTION	SHELL 43C-2784	UNA	STO,CBM	25	436.5
P123749W	2/24/2000	T58N	R84W	27	NE SE	FIDELITY EXPLORATION & PRODUCTION	SHELL 43D2/3-2784	UNA	STO,CBM	25	183.5
P123750W	2/24/2000	T58N	R84W	27	NE SE	FIDELITY EXPLORATION & PRODUCTION	SHELL 43M-2784	GST	STO,CBM	25	299.5
P123742W	2/24/2000	T58N	R84W	27	SW SE	FIDELITY EXPLORATION & PRODUCTION	DELAPP 34C-2784	GST	STO,CBM	25	358
P123743W	2/24/2000	T58N	R84W	27	SW SE	FIDELITY EXPLORATION & PRODUCTION	DELAPP 34D2/3-2784	GST	STO,CBM	25	159
P123745W	2/24/2000	T58N	R84W	27	SW SE	FIDELITY EXPLORATION & PRODUCTION	DELAPP 34M-2784	GST	STO,CBM	25	275
P143506W	3/18/2002	T58N	R84W	28	SW NE	J M HUBER CORPORATION	CHEVRON 7K-28 58-84	GSI	CBM	--	--
P143507W	3/18/2002	T58N	R84W	28	SW NE	J M HUBER CORPORATION	CHEVRON 7M-28 58-84	GSI	CBM	--	--
P016944P	8/15/1960	T58N	R84W	28	SE NE	J. VERNON STATES	STATES #3		STO	13	380
P143504W	3/18/2002	T58N	R84W	28	NE NW	J M HUBER CORPORATION	CHEVRON 3K-28 58-84	GSI	CBM	--	--
P143505W	3/18/2002	T58N	R84W	28	NE NW	J M HUBER CORPORATION	CHEVRON 3M-28 58-84	GSI	CBM	--	--
P130817W	11/9/2000	T58N	R84W	28	NE SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 43C-2884	GSI	STO,CBM	--	--
P130818W	11/9/2000	T58N	R84W	28	NE SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 43M-2884	GSI	STO,CBM	--	--
P130815W	11/9/2000	T58N	R84W	28	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34C-2884	GSI	STO,CBM	--	--
P130816W	11/9/2000	T58N	R84W	28	SW SE	FIDELITY EXPLORATION & PRODUCTION	CHEVRON 34M-2884	GSI	STO,CBM	--	--
P016943P	7/10/1961	T58N	R84W	29	NE SW	J. VERNON STATES	STATES #2		DOM	5	175
P016942P	5/15/1954	T58N	R84W	29	SE SW	J. VERNON STATES	STATES #1		STO	15	150
P016945P	9/25/1961	T58N	R84W	29	SE SW	J. VERNON STATES	STATES #4		STO	5	1200
P016947P	9/10/1954	T58N	R84W	29	NE SE	J. VERNON STATES	DEBSKI #1		STO	3	UNKNOWN
P057094W	5/20/1981	T58N	R84W	30	SW SE	GEORGE BUSZKIEWIC	VANATTA #1		DOM	10	80
P100385W	9/21/1995	T58N	R84W	33	NW NW	FRANK/MARY MOMMSEN	FM #1	UNA	DOM	8	60
P130821W	11/9/2000	T58N	R84W	34	NE NE	FIDELITY EXPLORATION & PRODUCTION	DELAPP 41C-3484	GSI	STO,CBM	--	--
P130822W	11/9/2000	T58N	R84W	34	NE NE	FIDELITY EXPLORATION & PRODUCTION	DELAPP 41M-3484	GSI	STO,CBM	--	--

GROUNDWATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P130819W	11/9/2000	T58N	R84W	34	NE NW	FIDELITY EXPLORATION & PRODUCTION	DELAPP 21C-3484	GSI	STO,CBM	--	--
P130820W	11/9/2000	T58N	R84W	34	NE NW	FIDELITY EXPLORATION & PRODUCTION	DELAPP 21M-3484	GSI	STO,CBM	--	--
P144416W	4/26/2002	T58N	R84W	35	SW SE	J M HUBER CORPORATION	WILSON 7M-35 58-84	GSI	CBM	--	--
P144417W	4/26/2002	T58N	R84W	35	SW SE	J M HUBER CORPORATION	WILSON 7K-35 58-84	GSI	CBM	--	--
P144418W	4/26/2002	T58N	R84W	35	SW SE	J M HUBER CORPORATION	WILSON 7D-35 58-84	GSI	CBM	--	--
P130823W	11/9/2000	T58N	R84W	35	NE NW	REDSTONE GAS PARTNERS LLC	DELAPP 21C-3584	GSI	STO,CBM	--	--
P130824W	11/9/2000	T58N	R84W	35	NE NW	REDSTONE GAS PARTNERS LLC	DELAPP 21D1-3584	GSI	STO,CBM	--	--
P130825W	11/9/2000	T58N	R84W	35	NE NW	REDSTONE GAS PARTNERS LLC	DELAPP 21M-3584	GSI	STO,CBM	--	--
P144393W	4/26/2002	T58N	R84W	35	NE NW	J M HUBER CORPORATION	WILSON 3D-35 58-84	GSI	CBM	--	--
P144421W	4/26/2002	T58N	R84W	35	NE NW	J M HUBER CORPORATION	WILSON 3M-35 58-84	GSI	CBM	--	--
P144422W	4/26/2002	T58N	R84W	35	NE NW	J M HUBER CORPORATION	WILSON 3K-35 58-84	GST	CBM	31.61	483
P020042P	12/31/1921	T58N	R84W	35	SW NW	HOWARD JORGENSON	JORGENSON #4	UNA	DOM,STO	25	200
P136276W	6/7/2001	T58N	R84W	35	SW NW	J M HUBER CORPORATION	TREMBATH 5D3-35 58-83	GSI	CBM	--	--
P144419W	4/26/2002	T58N	R84W	35	SW NW	J M HUBER CORPORATION	WILSON 5K-35 58-84	GSI	CBM	--	--
P144420W	4/26/2002	T58N	R84W	35	SW NW	J M HUBER CORPORATION	WILSON 5D-35 58-84	GSI	CBM	--	--
P144423W	4/26/2002	T58N	R84W	35	SW NW	J M HUBER CORPORATION	WILSON 5M-35 58-84	GSI	CBM	--	--
P144391W	4/26/2002	T58N	R84W	35	SW SW	J M HUBER CORPORATION	PADLOCK 13K-35 58-84	GSI	CBM	--	--
P142168W	1/15/2002	T58N	R84W	35	NE SE	J M HUBER CORPORATION	WILLSON 9-35 58-84	GSI	CBM	--	--
P118193W	8/9/1999	T58N	R84W	36	NE NE	J M HUBER CORPORATION	HUBER-DELAPP 1-36-58-84	UNA	STO,CBM	--	--
P144213W	4/15/2002	T58N	R84W	36	NE NE	J M HUBER CORPORATION	DELAPP 1D-36 58-84	GSI	CBM	--	--
P118194W	8/9/1999	T58N	R84W	36	NW NE	J M HUBER CORPORATION	HUBER-DELAPP 2-36-58-84	UNA	STO,CBM	--	--
P118196W	8/9/1999	T58N	R84W	36	SW NE	J M HUBER CORPORATION	HUBER-DELAPP 7-36-58-84	UNA	STO,CBM	--	--
P144211W	4/15/2002	T58N	R84W	36	SW NE	J M HUBER CORPORATION	DELAPP 7D-36 58-84	GSI	CBM	--	--
P118197W	8/9/1999	T58N	R84W	36	SE NE	J M HUBER CORPORATION	HUBER-DELAPP 8-36-58-84	UNA	STO,CBM	--	--
P118796W	9/16/1999	T58N	R84W	36	NE NW	J M HUBER CORPORATION	HUBER-DELAPP 3-36-58-84	UNA	CBM	--	--
P144212W	4/15/2002	T58N	R84W	36	NE NW	J M HUBER CORPORATION	DELAPP 3D-36 58-84	GSI	CBM	--	--
P144509W	5/9/2002	T58N	R84W	36	SW NW	J M HUBER CORPORATION	DELAPP 5D-36 58-84	GSI	CBM	--	--
P144510W	5/9/2002	T58N	R84W	36	SW NW	J M HUBER CORPORATION	DELAPP 5K-36 58-84	GSI	CBM	--	--
P118195W	8/9/1999	T58N	R84W	36	SE NW	J M HUBER CORPORATION	HUBER-DELAPP 6-36-58-84	UNA	STO,CBM	--	--
P118798W	9/16/1999	T58N	R84W	36	NE SW	J M HUBER CORPORATION	HUBER-DELAPP 11-36-58-84	UNA	CBM	--	--
P144214W	4/15/2002	T58N	R84W	36	NE SW	J M HUBER CORPORATION	DELAPP 11D-36 58-84	GSI	CBM	--	--
P144215W	4/15/2002	T58N	R84W	36	SW SW	J M HUBER CORPORATION	DELAPP 13K-36 58-84	GSI	CBM	--	--
P144216W	4/15/2002	T58N	R84W	36	SW SW	J M HUBER CORPORATION	DELAPP 13D-36 58-84	GSI	CBM	--	--
P118198W	8/9/1999	T58N	R84W	36	NE SE	J M HUBER CORPORATION	HUBER-DELAPP 9-36-58-84	UNA	STO,CBM	--	--
P144210W	4/15/2002	T58N	R84W	36	NE SE	J M HUBER CORPORATION	DELAPP 9D-36 58-84	GSI	CBM	--	--
P118797W	9/16/1999	T58N	R84W	36	NW SE	J M HUBER CORPORATION	HUBER-DELAPP 10-36-58-84	UNA	CBM	--	--
P005490W	5/12/1970	T58N	R84W	36	SW SE	RALPH DELAPP	DELAPP #2		DOM,STO	15	50
P144208W	4/15/2002	T58N	R84W	36	SW SE	J M HUBER CORPORATION	DELAPP 15K-36 58-84	GSI	CBM	--	--
P144209W	4/15/2002	T58N	R84W	36	SW SE	J M HUBER CORPORATION	DELAPP 15D-36 58-84	GSI	CBM	--	--
P018214P	8/1/1911	T58N	R85W	23	SW SE	WALTER R/PATRICIA ANN BAKER	SCHOOL HOUSE #1	UNA	STO	25	3
P018215P	8/1/1957	T58N	R85W	23	SE SE	DUANE L. STATES	SHEEPHERDER #1		STO	3	2
P113528W	1/13/1999	T58N	R85W	24	NW SE	ANNA LOU RANDAL	ANNA #2	UNA	STO	--	--
P113527W	1/13/1999	T58N	R85W	24	SW SE	ANNA LOU RANDAL	ANNA #1	UNA	STO	--	--
P028852W	1/15/1975	T58N	R85W	25	SE NE	GEORGE J. BUSZKIEWIC	BUSZKIEWIC #1 (DEEPENED)	UNA	DOM,STO	4	140
P028852W	1/15/1975	T58N	R85W	26	SE NE	GEORGE J. BUSZKIEWIC	BUSZKIEWIC #1 (DEEPENED)	UNA	DOM,STO	4	140
P079514W	4/21/1989	T58N	R85W	26	SE NE	GEORGE BUSZKIEWIC	BUSZKIEWIC #2	UNA	DOM	12	62

GROUNDWATER RIGHTS - MONTANA

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
W038277-00	1868	9	38	25	NESW	ROSA LYNNE	PLUM CREEK		STOC		10
C003994-00	1974	9	39	21	SESE	STATES VERNON	GROUNDWATER		GWCT	615	6
C039193-00	1981	9	39	29	NWNE	PUBLIC SERVICE CO OF OKLAHOMA	GROUNDWATER		GWCT		35
W048619-00	1961	9	39	29	SWNE	PUBLIC SERVICE CO OF OKLAHOMA	GROUNDWATER		STOC		50
W048625-00	1961	9	39	29	SWNE	PUBLIC SERVICE CO OF OKLAHOMA	GROUNDWATER		STOC		50
W048627-00	1953	9	39	29	SWNE	PUBLIC SERVICE CO OF OKLAHOMA	GROUNDWATER		STOC		10
C052193-00	1983	9	39	29	NWSE	STATES VERNON	GROUNDWATER		GWCT	64	10
W048624-00	1952	9	39	29	SENW	PUBLIC SERVICE CO OF OKLAHOMA	GROUNDWATER		STOC		15
W183825	1930	9	39	29	SWNE	ANKNEY SHAWN	ALDERSON SPRING		STOC		1.5
W183845	1909	9	39	29	SWNE	ANKNEY TROY	ALDERSON SPRING		STOC		100
W183894	1930	9	39	29	SWNE	ANKNEY SHAWN	ALDERSON SPRING		STOC		1.5
W183826-00	1930	9	39	33	NENW	WILLSON JOHN	GROUNDWATER		STOC		20
W048621-00	1973	9	39	32	NENE	PUBLIC SERVICE CO OF OKLAHOMA	GROUNDWATER		STOC		10
W183658-00	1965	9	39	35	SESE	CONSOLIDATION COAL CO	GROUNDWATER		STOC		5
W111723	1868	10	38	5	SWNE	PADLOCK RANCH CO INC	GROUNDWATER		STOC		5

Abbreviations for status: A&C=Abandoned and Cancelled; E&C=Eliminated and Cancelled; ABA=Abandoned; ADJ=Adjudicated; AME=Amended (Lands moved to new location no longer under this permit); CAN=Cancelled; DSC=Description; ELI=Eliminated; EXP=Expired; GST=Good standing pending receipt of legally required notices; OTH=Other; PU or PUW=Point of use for a well (does not mean the right is valid - a further check should be made of the actural record); REJ=Rejected by the State Engineer; REC=Lands received from another permit; REM=Remaining; TEM=Temporary; TRA=Transferred to another permit; UNA=Unadjudicated; ?=No entry in the data base for this appropriation.

Abbreviations for uses: DEW=Dewatering; DOM=Domestic; DSP=Domestic supply; FIS=Fish propagation; FLO=Flood control; HEX=Heat extraction; IND=Industrial; IRR=Irrigation; MAN=Manufacturing; MED=Medicinal; MIN=Mining; MIS=Miscellaneous; MON=Monitoring; MUN=Municipal; POW=Power development; REC=Recreation; RES=Reservoir supply; STO=Stock; TEM=Temporary use (normally construction of roads or oil well drilling); TST=Test Well; UTI=Public utility; WET=Wetlands; WIL=Wildlife.

Abbreviations for supply types (SupTy): ORI=Original supply; SUP=Supplemental supply from another surface water source; SEC=Supply from a reservoir; ADD=Additional supply from a well.

Record suffixes are denoted as follows: "A" indicates adjudicated or finalized water rights and unless the right is a territorial appropriation, there will be a match in the reference column from one of the following permit types for the unadjudicated portion of the water right. "C" permits are well statements of claim, filed from 1947 to 1957 for wells completed prior to April 1, 1947. "G" permits are well registrations, filed for wells completed after April 1, 1947. "P" permits are for stock and domestic use wells completed prior to May 24, 1969 and registered with the SEO prior to December 31, 1972. "W" permits are for wells with a priority date for the date of filing with the State Engineer. "D" signifies a ditch or pipeline permit. "E" signifies an enlargement ditch or pipeline permit. "S" signifies a stock reservoir permit. "R" signifies a reservoir permit.

SURFACE WATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Source
P6388R	12/10/1956	58	84	21	SWSW	J. VERNON STATES	STATES SW #2	UNA	STO	MIDDLE FORK YOUNGS CREEK
C29/301A	03/14/1898	58	84	22	NENE	A. H. ROUSCH	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C29/301A	03/14/1898	58	84	22	NWNE	A. H. ROUSCH	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C29/301A	03/14/1898	58	84	22	NWNE	A. H. ROUSCH	EISLE DITCH	PUD	IRR	LITTLE YOUNGS CREEK
C30/333A	03/29/1898	58	84	22	NENE	ARTHUR H. ROUSH	ROUSH DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C30/333A	03/29/1898	58	84	22	NWNE	ARTHUR H. ROUSH	ROUSH DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
P10585R	09/19/1997	58	84	22	NWNE	PITTSBURG & MIDWAY COAL MINING CO.	ROUSH DITCH	UNA	IND,STO, WIL,TEM	
P10585R	09/19/1997	58	84	22	SWNE	PITTSBURG & MIDWAY COAL MINING CO.	ROUSH DITCH	UNA	IND,STO, WIL,TEM	
P10585R	09/19/1997	58	84	22	NENW	PITTSBURG & MIDWAY COAL MINING CO.	ROUSH DITCH	UNA	IND,STO, WIL,TEM	
P10585R	09/19/1997	58	84	22	SENW	PITTSBURG & MIDWAY COAL MINING CO.	ROUSH DITCH	UNA	IND,STO, WIL,TEM	
P10585R	09/19/1997	58	84	22	NESW	PITTSBURG & MIDWAY COAL MINING CO.	ROUSH DITCH	UNA	IND,STO, WIL,TEM	
P362D	11/12/1892	58	84	22	NWNE	OSCAR OBERREICH	EISLE CREEK DITCH	PUD	IRR,DOM	EISELE CREEK
C27/265A	03/14/1898	58	84	22	NWNE	MARY SCULLENS	EISLE DITCH	PUD	IRR	LITTLE YOUNGS CREEK
C27/265A	03/14/1898	58	84	23	NWNE	MARY SCULLENS	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C27/265A	03/14/1898	58	84	23	SWNE	MARY SCULLENS	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C27/265A	03/14/1898	58	84	23	SWNW	MARY SCULLENS	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C27/265A	03/14/1898	58	84	23	SENW	MARY SCULLENS	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C27/266A	12/11/1905	58	84	22	NWNE	NICHOLAS SCULLENS	EISLE DITCH	PUD	IRR	LITTLE YOUNGS CREEK
C27/266A	12/11/1905	58	84	23	NENW	NICHOLAS SCULLENS	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C27/266A	12/11/1905	58	84	23	NWNW	NICHOLAS SCULLENS	EISLE DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
P12113S	07/29/1994	58	84	22	SENE	ASH CREEK MINING CO.	COUNTY ROAD	UNA	STO	LITTLE YOUNG'S CREEK
P1774D	03/14/1898	58	84	22	SENE	OSCAR OBERREICH**A.H. ROUSH	EISLE DITCH	UNA	IRR	LITTLE YOUNGS CREEK
P1774D	03/14/1898	58	84	23	NENW	OSCAR OBERREICH**A.H. ROUSH	EISLE DITCH	UNA	IRR	LITTLE YOUNGS CREEK
P1774D	03/14/1898	58	84	23	NWNW	OSCAR OBERREICH**A.H. ROUSH	EISLE DITCH	UNA	IRR	LITTLE YOUNGS CREEK
P8089R	05/30/1979	58	84	22	SENE	ASH CREEK MINING CO.	PSO #1 COUNTY ROAD	PUO	IND	LITTLE YOUNGS CREEK
P826R	02/24/1906	58	84	22	NENW	MARY SCULLEN	SCULLEN	PUO	STO,IRR	WEST BRANCH YOUNGS CREEK
P826R	02/24/1906	58	84	22	NWNW	MARY SCULLEN	SCULLEN	PU	STO,IRR	WEST BRANCH YOUNGS CREEK
P12112S	07/29/1994	58	84	22	NESW	ASH CREEK MINING CO.	SOUTHWEST	GST	STO	MIDDLE FORK YOUNG'S CREEK
P1620R	07/27/1909	58	84	22	SWSE	MARY WELCH	WELCH	PUO	IRR	NAMELESS CREEK
P1620R	07/27/1909	58	84	22	SESW	MARY WELCH	WELCH	PU	IRR	NAMELESS CREEK
P11893D	10/03/1912	58	84	22	NESE	MARY WELCH	WELCH DITCH #1 & LATERAL	UNA	IRR	OBERREICH DRAW
P11893D	10/03/1912	58	84	23	NESW	MARY WELCH	WELCH DITCH #1 & LATERAL	UNA	IRR	OBERREICH DRAW
P1790D	03/29/1898	58	84	22	NESE	ARTHUR H. ROUSH	ROUSH DITCH	EXP	IRR	LITTLE YOUNGS CREEK
P1790D	03/29/1898	58	84	22	NWSE	ARTHUR H. ROUSH	ROUSH DITCH	EXP	IRR	LITTLE YOUNGS CREEK
P1790D	03/29/1898	58	84	23	SWNW	ARTHUR H. ROUSH	ROUSH DITCH	EXP	IRR	LITTLE YOUNGS CREEK

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P1790D	03/29/1898	58	84	23	SENW	ARTHUR H. ROUSH	ROUSH DITCH	EXP	IRR	LITTLE YOUNGS CREEK
P1790D	03/29/1898	58	84	23	NESW	ARTHUR H. ROUSH	ROUSH DITCH	EXP	IRR	LITTLE YOUNGS CREEK
P1790D	03/29/1898	58	84	23	NWSW	ARTHUR H. ROUSH	ROUSH DITCH	EXP	IRR	LITTLE YOUNGS CREEK
P11894D	10/03/1912	58	84	22	SESE	MARY WELCH	WELCH #2 DITCH	PUD	IRR	FLOOD WATER
P1722D	01/24/1898	58	84	23	NENE	DENIMON BROS.	DENIMON DITCH	UNA	STO,IRR	YOUNGS CREEK
P1722D	01/24/1898	58	84	23	SENE	DENIMON BROS.	DENIMON DITCH	UNA	STO,IRR	YOUNGS CREEK
P1722D	01/24/1898	58	84	24	NWNW	DENIMON BROS.	DENIMON DITCH	ADJ	STO,IRR	YOUNGS CREEK
P1722D	01/24/1898	58	84	24	SENW	DENIMON BROS.	DENIMON DITCH	ADJ	STO,IRR	YOUNGS CREEK
P1722D	01/24/1898	58	84	24	NWSE	DENIMON BROS.	DENIMON DITCH	UNA	STO,IRR	YOUNGS CREEK
P1722D	01/24/1898	58	84	24	SWSE	DENIMON BROS.	DENIMON DITCH	UNA	STO,IRR	YOUNGS CREEK
P1722D	01/24/1898	58	84	24	SESE	DENIMON BROS.	DENIMON DITCH	UNA	STO,IRR	YOUNGS CREEK
P2898R	06/24/1915	58	84	23	SWNE	MARY N. SCULLEN	ENL OBERREICH	PUO	IRR	LITTLE YOUNGS CREEK
P2898R	06/24/1915	58	84	23	SENW	MARY N. SCULLEN	ENL OBERREICH	PU	IRR	LITTLE YOUNGS CREEK
C30/331A	01/27/1909	58	84	23	SWNE	NELLIE P. OBERREICH	OBERREICH RES	PUO	IRR	LITTLE YOUNGS CREEK
C30/331A	01/27/1909	58	84	23	SENW	NELLIE P. OBERREICH	OBERREICH RES	PU	IRR	LITTLE YOUNGS CREEK
C30/332A	01/27/1909	58	84	23	SWNE	NELLIE P. OBERREICH	OBERREICH DITCH	PUD	IRR	LITTLE YOUNGS CREEK
C30/332A	01/27/1909	58	84	23	NESE	NELLIE P. OBERREICH	OBERREICH DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C30/332A	01/27/1909	58	84	24	NWSW	NELLIE P. OBERREICH	OBERREICH DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C43/049A	06/24/1915	58	84	23	SWNE	MARY N. SCULLEN	ENL OBERREICH DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C43/049A	06/24/1915	58	84	23	SWNE	MARY N. SCULLEN	ENL OBERREICH DITCH	PUD	IRR	LITTLE YOUNGS CREEK
C43/049A	06/24/1915	58	84	23	SENE	MARY N. SCULLEN	ENL OBERREICH DITCH	ADJ	IRR	LITTLE YOUNGS CREEK
C37/284A	10/03/1912	58	84	23	NESW	MARY WELCH	WELCH #1 & LATERAL DITCH	ADJ	IRR	OBERREICH DRAW
C37/284A	10/03/1912	58	84	23	NWSW	MARY WELCH	WELCH #1 & LATERAL DITCH	ADJ	IRR	OBERREICH DRAW
C37/284A	10/03/1912	58	84	23	SESW	MARY WELCH	WELCH #1 & LATERAL DITCH	PUD	IRR	OBERREICH DRAW
C37/283A	10/03/1912	58	84	23	SWSW	MARY WELCH	WELCH RES	PU	IRR	OBERREICH DRAW
C37/283A	10/03/1912	58	84	23	SESW	MARY WELCH	WELCH RES	PUO	IRR	OBERREICH DRAW
C29/299A	01/24/1898	58	84	24	SWNW	OSCAR OBERREICH	DEMMON DITCH	ADJ	STO,IRR	YOUNGS CREEK
C29/299A	01/24/1898	58	84	24	NESW	OSCAR OBERREICH	DEMMON DITCH	ADJ	STO,IRR	YOUNGS CREEK
C29/299A	01/24/1898	58	84	24	NWSW	OSCAR OBERREICH	DEMMON DITCH	ADJ	STO,IRR	YOUNGS CREEK
TD273A	05/01/1887	58	84	24	SESW	WESLEY R. PENNOYER	PEOPLES DITCH	PUD	IRR	YOUNGS CREEK
TD273A	05/01/1887	58	84	25		WESLEY R. PENNOYER	PEOPLES DITCH	ADJ	IRR	YOUNGS CREEK
TD273A	05/01/1887	58	84	25	NWNE	WESLEY R. PENNOYER	PEOPLES DITCH	PU	IRR	YOUNGS CREEK
TD273A	05/01/1887	58	84	25	SWNE	WESLEY R. PENNOYER	PEOPLES DITCH	PU	IRR	YOUNGS CREEK
TD273A	05/01/1887	58	83	30		WESLEY R. PENNOYER	PEOPLES DITCH	ADJ	IRR	YOUNGS CREEK
TD273A	05/01/1887	58	83	30	SENW	WESLEY R. PENNOYER	PEOPLES DITCH	PU	IRR	YOUNGS CREEK
TD273A	05/01/1887	58	83	30	SESW	WESLEY R. PENNOYER	PEOPLES DITCH	PU	IRR	YOUNGS CREEK
C35/520A	11/02/1910	58	84	24	NESE	FRANK H. BAKER	BAKER #1 DITCH	ADJ	IRR	ASH CREEK
C43/048A	03/05/1917	58	84	24	SWSE	NETTIE A. VERLEY	ENL PEOPLES DITCH	PUD	IRR	YOUNGS CREEK
C43/048A	03/05/1917	58	83	30	NWSW	NETTIE A. VERLEY	ENL PEOPLES DITCH	ADJ	IRR	YOUNGS CREEK
C29/300A	02/16/1909	58	84	24	SESE	HENRY VERLEY	ENL GLADE WATER DITCH	PUD	IRR	YOUNGS CREEK
C29/300A	02/16/1909	58	83	20	NENW	HENRY VERLEY	ENL GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
C29/300A	02/16/1909	58	83	20	NWNW	HENRY VERLEY	ENL GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
C29/300A	02/16/1909	58	83	20	SWNW	HENRY VERLEY	ENL GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	84	25	NENW	JOHN D. ADAMS	GLADE WATER DITCH	PUD	IRR	YOUNGS CREEK

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TD272AA	04/15/1884	58	83	19		JOHN D. ADAMS	GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	83	19	NESE	JOHN D. ADAMS	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	83	19	SWSE	JOHN D. ADAMS	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	83	19	SESE	JOHN D. ADAMS	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	83	20		JOHN D. ADAMS	GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	83	20	NWSW	JOHN D. ADAMS	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272AA	04/15/1884	58	83	20	SWSW	JOHN D. ADAMS	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
P3751E	03/05/1917	58	84	25	SWSE	CHEVRON USA, INC.	VERLEY ENLG. OF PEOPLES DITCH	UNA	IRR	YOUNGS CREEK
P4098R	09/17/1928	58	84	26	SWSE	JOHN W. WHITE	WHITE	PU	STO,IRR	FLATBOTTOM DRAW
P4098R	09/17/1928	58	84	35	NENE	JOHN W. WHITE	WHITE	PUO	STO,IRR	FLATBOTTOM DRAW
P4098R	09/17/1928	58	84	35	NWNE	JOHN W. WHITE	WHITE	PU	STO,IRR	FLATBOTTOM DRAW
P11896D	10/03/1912	58	84	27	NENE	MARY WELCH	WELCH #4 DITCH	PUD	IRR	MOSQUITO DRAW
P11895D	10/03/1912	58	84	27	NWNE	MARY WELCH	WELCH #3 DITCH	PUD	IRR	FLOOD WATERS
P6387R	12/10/1956	58	84	27	NWNW	J. VERNON STATES	STATES SW #1	UNA	STO	STATES DRAW
P1621R	08/02/1909	58	84	27	NESW	J. B. WULFF**C. C. REYNOLDS	WULFF - REYNOLDS	PU	IRR	DRY CREEK
P1621R	08/02/1909	58	84	27	SESW	J. B. WULFF**C. C. REYNOLDS	WULFF - REYNOLDS	PUO	IRR	DRY CREEK
C21/188A	04/25/1904	58	84	28	SWSW	JOSEPH J. RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/188A	04/25/1904	58	84	28	SESW	JOSEPH J. RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/188A	04/25/1904	58	84	29	SESE	JOSEPH J. RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/188A	04/25/1904	58	84	33	NENE	JOSEPH J. RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/188A	04/25/1904	58	84	33	NENW	JOSEPH J. RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/188A	04/25/1904	58	84	33	NWNE	JOSEPH J. RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C37/285A	07/03/1915	58	84	29	NESW	W. E. WAGNER	ASH CREEK CANYON DITCH	ADJ	IRR	ASH CREEK
C37/285A	07/03/1915	58	84	29	NWSW	W. E. WAGNER	ASH CREEK CANYON DITCH	ADJ	IRR	ASH CREEK
C37/285A	07/03/1915	58	84	29	SESW	W. E. WAGNER	ASH CREEK CANYON DITCH	ADJ	IRR	ASH CREEK
C37/286A	07/03/1915	58	84	29	SWSW	W. E. WAGNER	WAGNERS LITTLE ASH CREEK DITCH	ADJ	IRR	LITTLE ASH CREEK
C21/189A	04/25/1904	58	84	29	SESE	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/189A	04/25/1904	58	84	33	SENE	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/189A	04/25/1904	58	84	34	SWNW	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/189A	04/25/1904	58	84	34	SENW	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/189A	04/25/1904	58	84	34	NESW	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/189A	04/25/1904	58	84	34	NESE	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/189A	04/25/1904	58	84	34	NWSE	MARY RENIE	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C75/124A	03/24/1983	58	84	33	SWNE	GEORGE SCHREIBEIS	SCHREIBEIS SPRINKLER #3	ADJ	IRR	ASH CREEK
C75/124A	03/24/1983	58	84	33	SENW	GEORGE SCHREIBEIS	SCHREIBEIS SPRINKLER #3	ADJ	IRR	ASH CREEK
C75/124A	03/24/1983	58	84	33	NENW	GEORGE SCHREIBEIS	SCHREIBEIS SPRINKLER #3	ADJ	IRR	ASH CREEK
C75/122A	05/21/1982	58	84	33	NWNW	GEORGE SCHREIBEIS	SCHREIBEIS SPRINKLER	ADJ	IRR	ASH CREEK
C75/123A	03/24/1983	58	84	33	NWNW	GEORGE SCHREIBEIS	SCHREIBEIS SPRINKLER #2	ADJ	IRR	ASH CREEK
P5985D	04/25/1904	58	84	34	NENW	JOSEPH J. RENIE**MARY RENIE**MINNIE AMELIA PRESTON WAGNER	ASH CREEK DITCH #4	UNA	IRR	ASH CREEK
C21/190A	04/25/1904	58	84	35	NESW	M. A. P. WAGNER	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK

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C21/190A	04/25/1904	58	84	35	NWSW	M. A. P. WAGNER	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/190A	04/25/1904	58	84	35	SWSW	M. A. P. WAGNER	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/190A	04/25/1904	58	84	35	SESW	M. A. P. WAGNER	ASH CREEK #4 DITCH	ADJ	IRR	ASH CREEK
C21/187A	04/25/1904	58	84	35	SWSE	M. A. P. WAGNER	ASH CREEK #3 DITCH	ADJ	IRR	ASH CREEK
C21/187A	04/25/1904	58	84	35	SESE	M. A. P. WAGNER	ASH CREEK #3 DITCH	ADJ	IRR	ASH CREEK
C71/084A	03/05/1963	58	84	36	SWNE	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	58	84	36	SENE	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	58	84	36	SESW	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	58	84	36	NESE	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	58	84	36	NWSE	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	58	84	36	NWSE	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	58	84	36	SWSE	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/084A	03/05/1963	57	84	2	SESW	RALPH DELAPP	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C29/296A	04/25/1907	58	84	36	SENE	W. E. WAGONER	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C29/296A	04/25/1907	58	84	36	NESE	W. E. WAGONER	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C29/296A	04/25/1907	57	84	2	SESW	W. E. WAGONER	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C29/296A	04/25/1907	58	83	31	SWNW	W. E. WAGONER	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
P5012R	01/23/1939	58	84	36	NENW	E. S. TOWNSEND	TOWNSEND #1	PU	STO,IRR	DRY DRAW
P5012R	01/23/1939	58	84	36	NWNW	E. S. TOWNSEND	TOWNSEND #1	PU	STO,IRR	DRY DRAW
P5012R	01/23/1939	58	84	36	SWNW	E. S. TOWNSEND	TOWNSEND #1	PU	STO,IRR	DRY DRAW
P5012R	01/23/1939	58	84	36	SENW	E. S. TOWNSEND	TOWNSEND #1	PUO	STO,IRR	DRY DRAW
TD319A	04/12/1887	58	84	36	NWNW	W.E. WAGNER	ASH CREEK DITCH	AME		ASH CREEK
C57/462A	04/12/1887	58	84	36	NESE	E. S. TOWNSEND	ASH CREEK DITCH	ADJ	IRR	ASH CREEK
C57/462A	04/12/1887	58	84	36	NWSE	E. S. TOWNSEND	ASH CREEK DITCH	ADJ	IRR	ASH CREEK
C57/462A	04/12/1887	58	84	36	SWSE	E. S. TOWNSEND	ASH CREEK DITCH	ADJ	IRR	ASH CREEK
C57/462A	04/12/1887	57	84	1	NWNW	E. S. TOWNSEND	ASH CREEK DITCH	ADJ	IRR	ASH CREEK
C21/179A	06/21/1902	58	84	36	NESE	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/179A	06/21/1902	58	84	36	SWSE	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/179A	06/21/1902	58	84	36	SESE	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/179A	06/21/1902	57	84	1	NENE	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/179A	06/21/1902	57	84	1	SENE	WM. E. WAGNER	PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C21/179A	06/21/1902	58	83	31	SWNW	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER

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C21/179A	06/21/1902	58	83	31	NWSW	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/179A	06/21/1902	58	83	31	SWSW	WM. E. WAGNER	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
P2016E	04/25/1907	58	84	36	NWSE	W. E. WAGNER	INTERSTATE DITCH (PENNOYER, WAGNER LAT.)	UNA	IRR	TONGUE RIVER
P2016E	04/25/1907	58	84	36	SESE	W. E. WAGNER	INTERSTATE DITCH (PENNOYER, WAGNER LAT.)	UNA	IRR	TONGUE RIVER
P2016E	04/25/1907	58	83	31	SWSW	W. E. WAGNER	INTERSTATE DITCH (PENNOYER, WAGNER LAT.)	UNA	IRR	TONGUE RIVER
C37/255A	06/21/1902	57	84	1	NWNE	ROBERT H. HERLAND	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C71/085A	05/20/1963	57	84	1	NWNE	MARY C. JOHNSON	OCONNOR SPRINKLER SYSTEM	ADJ	IRR	TONGUE RIVER
C71/085A	05/20/1963	57	84	1	NENW	MARY C. JOHNSON	OCONNOR SPRINKLER SYSTEM	ADJ	IRR	TONGUE RIVER
C71/085A	05/20/1963	57	84	2	SESW	MARY C. JOHNSON	OCONNOR SPRINKLER SYSTEM	PUD	IRR	TONGUE RIVER
P3998D	06/21/1902	57	84	1	SWNE	CHEVRON USA, INC.	PENNOYER	UNA	IRR,DOM	TONGUE RIVER
P3998D	06/21/1902	57	84	1	SENE	CHEVRON USA, INC.	PENNOYER	UNA	IRR,DOM	TONGUE RIVER
P3998D	06/21/1902	57	84	1	SENW	CHEVRON USA, INC.	PENNOYER	UNA	IRR,DOM	TONGUE RIVER
C21/183A	12/11/1905	57	84	1	SENE	DORA BROWN	ENL EVANS DITCH	PUD	IRR	TONGUE RIVER
C72/364A	03/26/1975	57	84	1	NENW	DONALD BERT & LUELLA M. STROUP	ENL O'CONNER #2 SPRINKLER SYSTEM	ADJ	IRR	ASH SPRINGS
C72/364A	03/26/1975	57	84	1	NWNW	DONALD BERT & LUELLA M. STROUP	ENL O'CONNER #2 SPRINKLER SYSTEM	ADJ	IRR	ASH SPRINGS
C72/023A	05/20/1963	57	84	1	NWNW	DONALD BERT & LUELLA M. STROUP	OCONNOR #2 SPRINKLER SYSTEM	ADJ	IRR	ASH SPRINGS
P5061S	07/01/1963	57	84	1	SWNW	ALVIN T. O'CONNOR	O'CONNOR	PUO	STO	OCONNER DR
OD1/084A	09/20/1893	57	84	1	NWSW		W W SPRINKLERS #1 #2 #3 #4	PUD	IRR	TONGUE RIVER
OD1/084A	09/20/1893	57	84	2	SESW		W W SPRINKLERS #1 #2 #3 #4	PUD	IRR	TONGUE RIVER
OD1/084A	09/20/1893	57	84	2	NESE		W W SPRINKLERS #1 #2 #3 #4	PUD	IRR	TONGUE RIVER
P7899D	04/25/1907	57	84	1	SWSW	W.E. WAGNER	WAGNER DITCH #2	UNA	IRR,DOM	TONGUE RIVER
P7899D	04/25/1907	57	84	1	SESW	W.E. WAGNER	WAGNER DITCH #2	UNA	IRR,DOM	TONGUE RIVER
P2015E	04/25/1907	57	84	1	NESE	W. E. WAGNER	EVANS DITCH (ENL. OF)	PUH	IRR	TONGUE RIVER
P2775E	02/24/1913	57	84	1	NESE	W. E. WAGNER	EVANS DITCH (ENL. OF)	PUH	IRR	TONGUE RIVER
P2410R	06/26/1912	57	84	1	SWSE	LENA B. DRISCOLL**MAUD G. FOSTER**ELERY D. FOSTER	SUPPLY	PUO	IRR	TONGUE RIVER
P8102R	02/05/1979	57	84	2	SENE	SHERIDAN ENTERPRISES, INC.	POND-C1	PUO	IND	DRAINAGE OF TONGUE RIVER
P8100R	02/05/1979	57	84	2	NESW	SHERIDAN ENTERPRISES, INC.	POND-A	PUO	IND	SMOKEY DRAW
P8101R	02/05/1979	57	84	2	NESW	SHERIDAN ENTERPRISES, INC.	POND-A TEMPORARY	PUO	IND,MIS	DRAINAGE OF TONGUE RIVER
C21/178A	06/21/1902	57	84	2	SESW	E. A. WHITNEY	PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	30	NWNE	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	30	SWNE	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	30	NESW	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	30	SESW	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER

SURFACE WATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Source
C21/178A	06/21/1902	58	83	30	NWSE	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	30	SWSE	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	31	NWNE	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C21/178A	06/21/1902	58	83	31	NENW	E. A. WHITNEY	PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/313A	06/03/1907	57	84	2	SESW	E. G. FOSS	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/313A	06/03/1907	58	83	20	SWNE	E. G. FOSS	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/313A	06/03/1907	58	83	20	NWSE	E. G. FOSS	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C62/409A	04/23/1951	57	84	2	SESW	HENRY C. VERLEY	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C62/409A	04/23/1951	58	83	20	NENW	HENRY C. VERLEY	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C62/409A	04/23/1951	58	83	20	SWNW	HENRY C. VERLEY	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C62/409A	04/23/1951	58	83	20	SENW	HENRY C. VERLEY	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	57	84	2	SESW	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	19	NESE	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	19	SWSE	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	19	SESE	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	20	NWSW	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	20	SWSW	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	30	NWNE	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	30	SWNE	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	30	NENW	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	30	SENW	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/115A	04/27/1955	58	83	30	NESW	WILLIAM F. BARBULA	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C64/280A	10/20/1954	57	84	2	SESW	HENRY C. VERLEY	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	PUD	IRR	TONGUE RIVER
C64/280A	10/20/1954	58	83	30	NWSW	HENRY C. VERLEY	ENL INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER

SURFACE WATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Source
CR7/345A	03/23/1973	58	83	19	SENE	BARBULA-TURLEY RANCH INC.	BARBULA TURLEY #1 STOCK RES	PUO	STO	FOSS DRAW
C31/314A	06/03/1907	58	83	19	SWSE	CHEVRON USA, INC.	PENNOYER DITCH, INTERSTATE DITCH (ENL. OF)	ADJ	IRR	TONGUE RIVER
C31/314A	06/03/1907	58	83	19	SESE	W. S. METZ	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/314A	06/03/1907	58	83	20	NESW	W. S. METZ	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/314A	06/03/1907	58	83	20	NWSW	W. S. METZ	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/314A	06/03/1907	58	83	20	SWSW	W. S. METZ	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/314A	06/03/1907	58	83	20	SESW	W. S. METZ	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/314A	06/03/1907	58	83	20	SWSE	W. S. METZ	INTERSTATE DITCH, ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
TD272BA	04/15/1884	58	83	20		HENRY VERLEY	GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
TD272BA	04/15/1884	58	83	20	SWNE	HENRY VERLEY	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272BA	04/15/1884	58	83	20	SENW	HENRY VERLEY	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272BA	04/15/1884	58	83	20	NESE	HENRY VERLEY	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272BA	04/15/1884	58	83	20	NWSE	HENRY VERLEY	GLADE WATER DITCH	PU	IRR	YOUNGS CREEK
TD272CA	04/15/1884	58	83	20		JOHN W. BOYLE	GLADE WATER DITCH	ADJ	IRR	YOUNGS CREEK
P1724E	06/03/1907	58	83	20	NENE	CHEVRON USA, INC.	PENNOYER DITCH, INTERSTATE DITCH (ENL. OF)	UNA	IRR	TONGUE RIVER
P1724E	06/03/1907	58	83	20	NWNE	CHEVRON USA, INC.	PENNOYER DITCH, INTERSTATE DITCH (ENL. OF)	UNA	IRR	TONGUE RIVER
P1724E	06/03/1907	58	83	20	SENE	CHEVRON USA, INC.	PENNOYER DITCH, INTERSTATE DITCH (ENL. OF)	UNA	IRR	TONGUE RIVER
C37/256A	06/03/1907	58	83	20	NENE	MABEL M. BOYLE	ENL PENNOYER DITCH INTERSTATE DITCH	ADJ	IRR	TONGUE RIVER
C37/256A	06/03/1907	58	83	20	NWNE	MABEL M. BOYLE	ENL PENNOYER DITCH INTERSTATE DITCH	ADJ	IRR	TONGUE RIVER
C31/315A	06/03/1907	58	83	20	SWNE	H. C. VERLEY	INTERSTATE DITCH ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
C31/315A	06/03/1907	58	83	20	SENW	H. C. VERLEY	INTERSTATE DITCH ENL PENNOYER DITCH	ADJ	IRR	TONGUE RIVER
CR7/344A	03/23/1973	58	83	20	NWNW	BARBULA-TURLEY RANCH INC.	BARBULA TURLEY #2 STOCK RES	PUO	STO	VERLEY DRAW
P5848E	10/16/1953	58	83	20	NESE	W. A. SEELY	WALKER-BOYER DITCH, SEELY ENL. OF	UNA	IRR	TONGUE RIVER

SURFACE WATER RIGHTS - WYOMING

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Source
P5848E	10/16/1953	58	83	20	NWSE	W. A. SEELY	WALKER-BOYER DITCH, SEELY ENL. OF	UNA	IRR	TONGUE RIVER
P5848E	10/16/1953	58	83	20	SWSE	W. A. SEELY	WALKER-BOYER DITCH, SEELY ENL. OF	PUD	IRR	TONGUE RIVER
P5848E	10/16/1953	58	83	20	SWSE	W. A. SEELY	WALKER-BOYER DITCH, SEELY ENL. OF	PUH	IRR	TONGUE RIVER
TD323A	06/04/1890	58	83	29		T. L. ROWLAND	ROWLAND DITCH CO DITCH	ADJ	IRR	TONGUE RIVER
TD323A	06/04/1890	58	83	29	SWSW	T. L. ROWLAND	ROWLAND DITCH CO DITCH	PU	IRR	TONGUE RIVER
TD323A	06/04/1890	58	83	30	SESE	T. L. ROWLAND	ROWLAND DITCH CO DITCH	PU	IRR	TONGUE RIVER
P32248D	11/03/1999	58	83	29	NWNW	LEROY TAYLOR	TAYLOR INVESTMENTS, LLC, NO. 1 PUMP	UNA	IRR	TONGUE RIVER
P32248D	11/03/1999	58	83	30	NENE	LEROY TAYLOR	TAYLOR INVESTMENTS, LLC, NO. 1 PUMP	UNA	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	29	NWNW	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	29	SWNW	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	29	SENW	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	29	NESW	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	29	NWSW	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	30	NENE	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	30	SENE	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	30	NESE	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
CA1/266A	04/20/1897	58	83	30	NWSE	A. R. FRISBIE	ENL ROWLAND DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	NENE	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	NWNE	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	SWNE	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	SENE	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	SENW	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	NESW	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	NWSW	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	SWSW	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	SESW	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	NWSE	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER
C62/004A	03/15/1945	58	83	31	SWSE	INC. WHITNEY BENEFITS	WHITNEY DITCH	ADJ	IRR	TONGUE RIVER

SURFACE WATER RIGHTS - MONTANA

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Source
W048615-00	02/26/1898	09S	39E	32	LOT 4	PSO			IRR	LITTLE YOUNGS CREEK
W048618-00	12/19/11	09S	39E	32	LOT 4	PSO			IRR	LITTLE YOUNGS CREEK
W183838-00	11/26/08	09S	39E	32	LOT 6	SHELL MINING CO			STO	LITTLE YOUNGS CREEK
W183885-00	02/26/1898	09S	39E	32	LOT 4	SHELL MINING CO			IRR	LITTLE YOUNGS CREEK
W183888-00	12/19/11	09S	39E	32	LOT 4	SHELL MINING CO			IRR	LITTLE YOUNGS CREEK
W183874-00	05/01/11	09S	39E	33	NESWNE	SHELL MINING CO			IRR	YOUNGS CREEK
W183862-00		09S	39E	34	SW	SHELL MINING CO			STO	YOUNGS CREEK
W183893-00	05/01/10	10S	38E	1	LOT 3	SHELL MINING CO			IRR	LITTLE YOUNGS CREEK
W183844-00		10S	38E	1	SWSWNE	SHELL MINING CO			STO	LITTLE YOUNGS CREEK

Abbreviations for status: A&C=Abandoned and Cancelled; E&C=Eliminated and Cancelled; ABA=Abandoned; ADJ=Adjudicated; AME=Amended (Lands moved to new location no longer under this permit); CAN=Cancelled; DSC=Description; ELI=Eliminated; EXP=Expired; GST=Good standing pending receipt of legally required notices; OTH=Other; PU or PUW=Point of use for a well (does not mean the right is valid - a further check should be made of the actural record); REJ=Rejected by the State Engineer; REC=Lands received from another permit; REM=Remaining; TEM=Temporary; TRA=Transferred to another permit; UNA=Unadjudicated; ?=No entry in the data base for this appropriation.

Abbreviations for uses: DEW=Dewatering; DOM=Domestic; DSP=Domestic supply; FIS=Fish propagation; FLO=Flood control; HEX=Heat extraction; IND=Industrial; IRR=Irrigation; MAN=Manufacturing; MED=Medicinal; MIN=Mining; MIS=Miscellaneous; MON=Monitoring; MUN=Municipal; POW=Power development; REC=Recreation; RES=Reservoir supply; STO=Stock; TEM=Temporary use (normally construction of roads or oil well drilling); TST=Test Well; UTI=Public utility; WET=Wetlands; WIL=Wildlife.

Abbreviations for supply types (SupTy): ORI=Original supply; SUP=Supplemental supply from another surface water source; SEC=Supply from a reservoir; ADD=Additional supply from a well.

Record suffixes are denoted as follows: "A" indicates adjudicated or finalized water rights and unless the right is a territorial appropriation, there will be a match in the reference column from one of the following permit types for the unadjudicated portion of the water right. "C" permits are well statements of claim, filed from 1947 to 1957 for wells completed prior to April 1, 1947. "G" permits are well registrations, filed for wells completed after April 1, 1947. "P" permits are for stock and domestic use wells completed prior to May 24, 1969 and registered with the SEO prior to December 31, 1972. "W" permits are for wells with a priority date for the date of filing with the State Engineer. "D" signifies a ditch or pipeline permit. "E" signifies an enlargement ditch or pipeline permit. "S" signifies a stock reservoir permit. "R" signifies a reservoir permit.

APPENDIX H

AIR QUALITY IMPACT TECHNICAL SUPPORT DOCUMENT

AIR QUALITY IMPACT TECHNICAL SUPPORT DOCUMENT

As discussed in Section 4.8.4, an air quality impact assessment was conducted during preparation of the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003a) and the Montana *Statewide Oil and Gas Final EIS and Proposed Amendment of the Powder River and Billings RMPs* (BLM 2003b). These documents will be referred to as the "Wyoming PRB Oil and Gas Project EIS" and the "Montana Statewide EIS" in the following discussion. The air quality impact analysis was prepared to evaluate the impacts of proposed oil and gas development in northeastern Wyoming and southeastern Montana on air quality in the region. This air quality impact assessment included projected coal mining operations in the Wyoming and Montana PRB, and the results are therefore included in the cumulative impact section of this EIS and this appendix. The following technical support document describes the processes used to conduct the air quality impact assessment, and provides summaries of relevant analysis data:

Argonne National Laboratory.

2002. Technical Support Document - Air Quality Impact Assessment for the Montana Statewide Oil and Gas Final EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Montana and Wyoming State Offices, by the Environmental Assessment Division, Argonne National Laboratory. Argonne, Illinois.

Copies of this technical support document are available upon request from:

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National Science and Technology Center (ST-133)
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Introduction

Air pollution impacts are limited by local, state, tribal, and federal air quality regulations, standards, and implementation plans established under the CAA and administered by the WDEQ/AQD and the EPA. Although not applicable to the Alternatives analyzed in the Wyoming PRB Oil and Gas Project EIS or this EIS, the MDEQ/AWM has similar jurisdiction over potential air pollutant emission sources in Montana, which can have a cumulative impact with WDEQ/AQD approved sources.

Fugitive dust and exhaust from construction activities, along with air pollutants emitted during operation (i.e., well operations, booster [field] and pipeline [sales] compressor engines, etc.), are potential causes of air quality impacts. These issues are more likely to generate public concern where natural gas development activities occur near residential areas. The USFS, NPS, and USFWS have also expressed concerns regarding potential atmospheric deposition (acid rain) and visibility impacts within distant downwind PSD Class I and PSD Class II sensitive areas under their administration, located throughout Wyoming, Montana, southwestern North Dakota, western South Dakota, and northwestern Nebraska.

Existing Air Quality

The Project Area for the Wyoming PRB Oil and Gas Project EIS includes Campbell, Sheridan, Johnson, and northern Converse Counties. The Project Area for the Montana Statewide EIS includes all of Carter, Powder River, Big Horn, Yellowstone, Carbon, Stillwater, Sweetgrass, Wheatland, Golden Valley, Musselshell, and Treasure Counties, and portions of Rosebud and Custer Counties. The General Analysis Area for this EIS (the P&M Land Exchange) is located in northern Sheridan County, Wyoming, which lies near the northwest corner of the Project Area for the Wyoming PRB Oil and Gas Project EIS.

As described in Section 3.4.5.4, specific air quality monitoring is not conducted throughout most of the Project Area for the Wyoming PRB Oil and Gas Project EIS and the Montana Statewide EIS, but air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. As part of the Air Quality Impact Assessment prepared by Argonne National Laboratory (Argonne 2002), monitoring data measured throughout northeastern Wyoming and southeastern Montana were assembled and reviewed. Although monitoring is primarily conducted in urban or industrial areas, the data selected are considered to be the best available representation of background air pollutant concentrations throughout the Project Area. Specific values presented in Table H-1 were used to define background conditions in the air quality impact analysis. The assumed background pollutant concentrations

are below applicable ambient air quality standards for all pollutants and averaging times. These National and Wyoming standards, and PSD increment values, are also presented in Table H-1.

Table H-1. Assumed Background Concentrations, Applicable Ambient Air Quality Standards, and PSD Increment Values (in µg/m^3).

Pollutant	Averaging Time [a]	Background Concentration	National Ambient Air Quality Standards	Wyoming Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
carbon monoxide	1-hour	3,500[b]	40,000	40,000	- - -	- - -
	8-hours	1,500[b]	10,000	10,000	- - -	- - -
lead	Quarterly	n/a	1.5	1.5	- - -	- - -
nitrogen dioxide	Annual	16.5[c]	100	100	2.5	25
ozone	1-hour	82[d]	235	235	- - -	- - -
	8-hours	130[d]	157	157	- - -	- - -
$PM_{2.5}$	24-hours	19[f]	65	65	- - -	- - -
	Annual	7.6[f]	15	15	- - -	- - -
PM_{10}	24-hours	42[f]	150	150	8	30
	Annual	17[f]	50	50	4	17
sulfur dioxide	3-hours	8[e]	1,300	1,300	25	512
	24-hours	8[e]	365	260	5	91
	Annual	3[e]	80	60	2	20

[a] Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
[b] Amoco Ryckman Creek collected for an 8 month period during 1978-1979, summarized in the Riley Ridge EIS (BLM 1983)
[c] Data collected in Gillette, Wyoming (1996 - 1997
[d] Data collected in Pinedale, Wyoming (1992 - 1994)
[e] Data collected at Devil's Tower (1983)
[f] Data collected in Gillette, Wyoming (1999)
n/a – data not available

Regulatory Framework

The NAAQS and WAAQS set the absolute upper limits for specific air pollutant concentrations at all locations where the public has access. The analysis of the proposed Alternatives must demonstrate continued compliance with all applicable local, state, tribal, and federal air quality standards. Existing air quality throughout most of the Project Area for the Wyoming PRB Oil and Gas Project EIS and Montana Statewide EIS is in attainment with all ambient air quality standards, as demonstrated by the relatively low concentration levels presented in Table H-1. However, four areas have been designated as federal nonattainment areas where the applicable standards have been violated in the past: Sheridan, Wyoming (PM_{10} - moderate); and Billings (CO), Lame Deer (PM_{10} - moderate) and Laurel (SO_2 - primary), Montana. EPA Region 8 staff are concerned that PM_{10} monitoring data collected near and south of Gillette, Wyoming, have also exceeded both the NAAQS and the available PSD Class II increment. Specific monitoring data are presented in Tables H-2 and H-3.

Table H-2. Annual Average PM_{10} Monitoring Data Collected Near and South of Gillette, Wyoming (in µg/m³).

Location	Station Number	1996	1997	1998	1999	2000	2001	2002 [a]
Rochelle R0-1	869	n/a	n/a	[15.3]	24.2	20.2	22.6	[25] [b]
North Rochelle E	874	n/a	n/a	n/a	[40] [b]	[51] [b]	[50] [b]	[35] [b]
Black Thunder BTM 26-2	877	21.0	17.7	23.2	33.4	30.9	25.6	[30] [b]
Antelope Site 4	881	n/a	14.5	13.4	16.2	16.7	19.8	[12] [b]
Triton Coal / Buckskin Mine	884	11.5	12.6	12.1	12.0	17.6*	18.3	[16] [b]
Cordero Hv-2	885	14.3	15.3	15.1	14.5	26.0*	24.3*	[30] [b]
Cordero Hv-3	889	11.9	10.9	10.4	9.7	17.1	19.8	[14] [b]
Coal Creek Ccm 26	890	9.0	7.9	8.6	8.5	8.3	[2.0]	n/a
Thunder Basin Coal / BTM	891	13.8	12.0	14.4	17 [b]	24.5	37 [b]	[57] [b]
Belle Ayr Ba-4, 5n, 5s	892	15.5	14.6	14.2	15.0	20.1	25 [b]	[20] [b]
Jacob Ranch Site 4	894	28.3	24.3*	25.1*	35.4*	35.9*	30.6*	n/a
Dry Fork Coal Co	896	13.8	13.0	10.5	9.3	10.8	13.2	[13] [b]
Triton Coal / Gillette	899	21.5	22.7	15.3	17.2	19.0*	21.0	[18] [b]
AMAX Eagle Butte Eb-5	900	12.5	10.6	11.6	11.7	15.0	15 [b]	[15] [b]
Jacob Ranch Site 5	905	15.0	14.6	15.1	20.5	21.3	31.7	n/a
North Rochelle 1	907	n/a	20.6	18.4	38.6	46.8	**50.8**	[52] [b]
Black Thunder BTM 36-1	915	n/a	n/a	n/a	n/a	[18] [b]	26 [b]	[16] [b]
Gillette, Wyoming	1002	16.1	16.7	17.6*	19.1*	20.7*	19.9*	[17] [b]

[a] Incomplete data year; values reported through July 1, 2002.
[b] Supplemental data provided by (Payton 2002).
µg/m³ - micrograms per cubic meter.
n/a - data not available.
[data] - data in brackets are not reliable due to the small number of samples collected.
data* - starred data are combined from two or more samplers operating at the same location during the same year.

Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation. In addition, the U.S. Congress (through the CAA Section 116) authorized local, state, and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than federal requirements. Also, under both FLPMA and the CAA, BLM can not authorize any activity which would not conform to all applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans.

Given the current attainment status for most of the Project Area for the Wyoming PRB Oil and Gas Project EIS and Montana Statewide EIS, future development projects which have the potential to emit more than 250 tpy of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tpy) would be required to undergo a site-specific regulatory PSD Increment Consumption analysis under the federal New Source Review permitting regulations. Development projects subject to the PSD regulations may also be required by the applicable air quality regulatory agencies to incorporate additional emission control measures (including a BACT analysis and determination) to ensure protection of air quality resources, and

demonstrate that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for NO_2, PM_{10}, and SO_2.

Table H-3. Second Maximum 24-hour Average PM_{10} Monitoring Data Collected Near and South of Gillette, Wyoming (in µg/m^3).

Location	Station Number	1996	1997	1998	1999	2000	2001	2002 [a]
Rochelle R0-1	869	n/a	n/a	[23]	62	46	63	[55] [b]
North Rochelle E	874	n/a	n/a		122	143	**156** [b]	[124] [b]
Black Thunder BTM 26-2	877	66	44	55	125	123	101	[62] [b]
Antelope Site 4	881	n/a	32	32	35	50	54	[25] [b]
Triton Coal / Buckskin Mine	884	31	34	36	36	53*	73 [b]	[43] [b]
Cordero Hv-2	885	32	36	42	36	73*	65*	[55] [b]
Cordero Hv-3	889	30	22	25	26	46	47	[40] [b]
Coal Creek Ccm 26	890	20	16	23	25	31	n/a	n/a
Thunder Basin Coal / BTM	891	34	26	39	43 [b]	80	97 [b]	[155] [b]
Belle Ayr Ba-4, 5n, 5s	892	39	34	53	56	48	70 [b]	[35] [b]
Jacob Ranch Site 4	894	101	62*	54*	103*	88*	119 [b]	n/a
Dry Fork Coal Co	896	34	39	35	22	32	42	[34] [b]
Triton Coal / Gillette	899	85	65	37	45	54*	80 [b]	[73] [b]
AMAX Eagle Butte Eb-5	900	30	37	37	51	48	61	[36] [b]
Jacob Ranch Site 5	905	44 [b]	39	43	47	50	97	n/a
North Rochelle 1	907	n/a	39	49	100	125	**268** [b]	[211] [b]
Black Thunder BTM 36-1	915	n/a	n/a	n/a	n/a	[24]	76 [b]	[31] [b]
Gillette, Wyoming	1002	46 [b]	29	36*	42*	60*	43 [b]	[35] [b]

[a] Incomplete data year; values reported through July 1, 2002.
[b] Supplemental data provided by (Payton 2002).
µg/m^3 - micrograms per cubic meter.
n/a - data not available.
[data] - data in brackets are not reliable due to the small number of samples collected.
data* - starred data are combined from two or more samplers operating at the same location during the same year.

A regulatory PSD Increment Consumption analysis may be conducted as part of a New Source Review, or independently. The determination of PSD increment consumption is a legal responsibility of the applicable air quality regulatory agencies, with EPA oversight. In addition, an analysis of cumulative impacts due to all existing sources and the permit applicant's sources is also required during New Source Review to demonstrate that applicable ambient air quality standards will be met during the operational lifetime of the permit applicant's operations.

Existing surface coal mining operations in the PRB are not currently affected by the PSD regulations for two reasons: surface coal mines are not on the EPA list of 28 major emitting facilities for PSD regulation, and point-source emissions from individual mines do not exceed the PSD emissions threshold of 250 tpy.

Sources subject to the PSD permit review procedure are also required to demonstrate potential impacts to AQRVs. These include visibility impacts, degradation of mountain lakes from atmospheric deposition (acid rain), and effects on sensitive flora and fauna in the Class I areas. The CAA also provides specific visibility protection procedures for the mandatory federal Class I areas designated by the U.S. Congress on August 7, 1977, which included wilderness

areas greater than 5,000 acres in size, as well as national parks and national memorial parks greater than 6,000 acres in size as of that date. The Fort Peck and Northern Cheyenne tribes have also designated their lands as PSD Class I, although the national visibility regulations do not apply in these areas. The allowable incremental impacts for NO_2, PM_{10}, and SO_2 within these PSD Class I areas are very limited. The remainder of the Project Area for the Wyoming PRB Oil and Gas Project EIS and Montana Statewide EIS is designated PSD Class II with less stringent requirements.

Agency Roles and Authorities

EPA

The EPA administers the Federal CAA, (42 U.S.C. 7401 et seq.) to maintain the NAAQS that protect human health and to preserve the rural air quality in the region by assuring the PSD Class I and Class II increments for SO_2, NO_2, and PM_{10}, are not exceeded. EPA has delegated this CAA authority to the States of Montana and Wyoming.

Until the Tribes have an EPA-approved Tribal program, EPA will administer air quality requirements within Indian country. EPA is responsible for assuring that NAAQS are attained and that the Tribally-designated Northern Cheyenne Class I sensitive airshed is protected, as well as the Class II increment limits that apply on the Crow Reservation. EPA will implement an air permitting program for major sources within Indian country, including BACT analysis, where appropriate. At this time, there is no federal minor source permitting program. Therefore, EPA cannot regulate minor sources in Indian country directly unless EPA, based on the results of a PSD increment consumption model, decides to implement a Federal Implementation Plan (FIP). Based on future regulatory modeling in cooperation with MDEQ, EPA and BIA may require either Tribe to apply BACM to unimproved roads in Indian country or other control measures sufficient to avoid exceeding the Class I and Class II increment limits for PM_{10}.

Wyoming DEQ

Wyoming regulates pollutants emitted into the air through the Wyoming Environmental Quality Act (W.S. 35-11-101 et. seq.). Wyoming is also authorized by an approved State Implementation Plan (SIP) to administer all requirements of the PSD permit program under the CAA. Additionally, the approved Wyoming SIP contains a number of programs which provide for the implementation, maintenance, and enforcement of the NAAQS, including a New Source Review program for minor source permitting which requires, among other things, application of BACT for all new or modified sources regardless of size or source category. Included as well are authorities for the control of particulate emissions, including fugitive particulate emissions from haul roads, access roads, or general facility boundaries. Wyoming is also delegated

responsibility to operate an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the NAAQS and WAAQS.

Bureau of Land Management

NEPA requires that federal agencies consider mitigation of direct and cumulative impacts during their preparation of an EIS (BLM Land Use Planning Manual 1601). Under the CAA, federal agencies are to comply with State Implementation Plans regarding the control and abatement of air pollution. Prior to approval of RMPs or Amendments to RMPs, the State Director is to submit any known inconsistencies with SIPs to the Governor of that State. If the Governor of the State recommends changes in the proposed RMP or Amendment to meet SIP requirements, the State Director shall provide the public an opportunity to comment on those recommendations. (BLM Land Use Planning Manual at Section 1610.3-2.)

Forest Service

The USFS administers nine wilderness areas (WAs) that could be affected by direct effects associated with the proposed development considered in the Wyoming PRB Oil and Gas Project EIS and Montana Statewide EIS: Bridger WA; Fitzpatrick WA; North Absaroka, Absaroka-Beartooth, and Washakie WAs, next to Yellowstone National Park; Teton WA; U.L. Bend WA; Cloud Peak WA; and Popo Agie WA with mandatory Class I designation. As federal land mangers, the USFS could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the USFS determine impairment of WAs, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

National Park Service

Three areas administered by the NPS, Yellowstone National Park, Devils Tower National Monument, and Bighorn Canyon National Recreation Area, could be affected by direct effects associated with the proposed development considered in the Wyoming PRB Oil and Gas Project EIS and Montana Statewide EIS. As federal land managers, the Park Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Park Service determine impairment of NPS-administered Class I areas, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

Air Quality Impact Assessment

Section 4.4.4 of this EIS discusses the air quality impact modeling results for the proposed Ash Creek Mine considered in this EIS. Section 4.8.4 of this EIS discusses the cumulative air quality impact assessment that was conducted for

the Wyoming PRB Oil and Gas Project EIS and the Montana Statewide EIS. An extensive air quality impact assessment technical support document was also prepared by Argonne National Laboratory (Argonne 2002) and is available for review. Argonne analyzed potential impacts from: individual proposed Alternatives 1, 2A, 2B, and 3 of the Wyoming PRB Oil and Gas Project EIS; "Other" (non-Alternative) emission sources, including surface coal mining in the Wyoming and Montana PRB; and all sources cumulatively by Alternative. Alternatives 1, 2A, and 2B of the Wyoming PRB Oil and Gas Project EIS have similar emission inventories, except half of the booster (field) compressors would be electrified under Alternative 2A, and all of the booster (field) compressors would be electrified under Alternative 2B.

The air quality impact assessment conducted for the Wyoming PRB Oil and Gas Project EIS and Montana Statewide EIS was based on the best available engineering data and assumptions, meteorology data, and dispersion modeling procedures, as well as professional and scientific judgment. However, where specific data or procedures were not available, reasonable assumptions were incorporated. For example, the air quality impact assessment assumed that the maximum CBM, conventional oil, coal and other development would occur simultaneously, whereas actual development would occur under different time schedules.

Potential air pollutant emissions from the emission sources under the proposed Alternative for the Wyoming PRB Oil and Gas Project EIS were combined with other (non-Alternative) sources to determine the total potential cumulative air quality impacts. These other (non-Alternative) sources included development associated with emission sources permitted: 1) by the WDEQ/AQD; 2) by the MDEQ/AWM; and 3) within the states of North Dakota, South Dakota, and Nebraska; plus 4) the Montana Statewide EIS Alternative sources.

Potential direct, indirect, and cumulative air quality impacts from the Proposed Action and Alternatives for the Wyoming PRB Oil and Gas Project EIS, and other (non-Alternative) sources, including surface coal mining in the Wyoming and Montana PRB, were analyzed and reported solely under the requirements of NEPA, in order to assess and disclose reasonably foreseeable impacts to both the public and the BLM decision maker. Due to the preliminary nature of this NEPA analysis, it should be considered an estimate of predicted impacts. Actual impacts at the time of development (subject to air pollutant emission source permitting) are likely to be different.

Given the lack of representative wind measurements throughout the CBM emphasis area, the EPA CALPUFF dispersion model was used with regional wind speed and direction values derived from the 1996 MM5 (mesoscale model) and CALMET meteorological models (Argonne 2002). Meteorological information was assembled to characterize atmospheric transport and dispersion from several 1996 data sources, including: 36 km gridded MM5 (mesoscale model) values with continuous four-dimensional data assimilation; and hourly surface observations (wind speed, wind direction, temperature,

cloud cover, ceiling height, surface pressure, relative humidity, and precipitation.)

Potential air quality impacts were predicted using the EPA CALPUFF dispersion model. The meteorology data and air pollutant emission values were combined to predict maximum potential direct, indirect, and cumulative near-field air quality impacts in the vicinity of assumed CBM well and CBM pipeline compressor engine emission sources for comparison with applicable air quality standards and PSD Class II increments. Maximum potential near-field particulate matter emissions from traffic on unpaved roads and during well pad construction were used to predict the maximum annual and 24-hour average $PM_{2.5}$, PM_{10}, and SO_2 impacts. Maximum air pollutant emissions from each CBM well would be temporary (i.e., occurring during a 12-day construction period) and would occur in isolation, without significantly interacting with adjacent well locations. Particulate matter emissions from well pad and resource road construction would be minimized by application of water and/or chemical dust suppressants. The control efficiency of these dust suppressants was computed at 50 percent during construction. During well completion testing, natural gas could be burned (flared) up to 24 hours.

Air pollutant dispersion modeling was also performed to quantify CO, NO_2, $PM_{2.5}$, PM_{10}, and HAP impacts during operation. Operation emissions would primarily occur due to increased CBM pipeline compression requirements, including booster (field) and pipeline (sales) compressor stations. Since produced natural gas is nearly pure methane, with little or no liquid hydrocarbons or sulfur compounds, direct VOC emissions or objectionable odors are not likely to occur. HAP impacts were predicted based on an assumed 9,900 hp, six-unit, reciprocating compressor engine station operating at full load with emissions generated by a single stack.

The significance criteria for potential air quality impacts include local, state, tribal, and federally enforced legal requirements to ensure air pollutant concentrations will remain within specific allowable levels. These requirements and legal limits were presented in Table H-1. Where legal limits have not been established, BLM uses the best available scientific information to identify thresholds of significant adverse impacts. Thresholds have been identified for HAP exposure, potential ANC changes to sensitive lake water chemistry, and a 1.0 dv “just noticeable change” in potential visibility impacts.

Since neither the WDEQ/AQD nor EPA have established HAP standards, predicted eight-hour HAP concentrations were compared to a range of eight-hour state maximum Acceptable Ambient Concentration Levels (EPA 1997a). Pollutants which were predicted to exceed these state threshold levels were also analyzed to determine the possible incremental cancer-risk for a most likely exposure (MLE) to residents, and to a maximally exposed individual (MEI), such as compressor station workers. These cancer risks were calculated based on the maximum predicted annual concentrations, EPA’s unit risk factors for

carcinogenic compounds (EPA 1997b), and an adjustment for time spent at home or on the job.

The EPA CALPUFF dispersion model was also used to determine maximum far-field ambient air quality impacts at downwind mandatory federal PSD Class I areas, and other sensitive receptors, to: 1) determine if the PSD Class I increments might be exceeded; 2) calculate potential total sulfur and nitrogen deposition, and their related impacts to in sensitive lakes; and 3) predict potential visibility impacts (regional haze) within distant sensitive receptors.

Several lakes within five USFS designated wilderness areas were identified as being sensitive to atmospheric deposition and for which the most recent and complete data have been collected. The USFS (Fox et al. 1989) has identified the following total deposition (wet plus dry) thresholds below which no adverse impacts are likely: five kg/ha-yr for sulfur, and three kg/ha-yr for nitrogen. The USFS (2000) has also developed a screening method which identifies the following Limit of Acceptable Change regarding potential changes in lake chemistry: no more than a ten percent change in ANC for those water bodies where the existing ANC is at or above 25 µeq/L and no more than a 1.0 µeq/L change for those extremely sensitive water bodies where the existing ANC is below 25 µeq/L. No sensitive lakes were identified by either the NPS or USFWS.

Since the potential air pollutant emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to impact the distant sensitive areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 dv) in visibility when compared to background conditions. A 1.0 dv change is considered potentially significant in mandatory federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 CFR 51.300 et seq.), and as originally presented in Pitchford and Malm (1994). A 1.0 dv change is defined as about a ten percent change in the extinction coefficient (corresponding to a two to five percent change in contrast, for a black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, such as due to preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change greater than 1.0 dv might be required to be a "just noticeable change". However, this NEPA analysis is not designed to predict specific visibility impacts for specific views in specific mandatory federal Class I areas based on

specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a pre-construction air quality PSD permit review, the applicable air quality regulatory agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as inherent conservatism in the modeling analyses) should all be considered when assessing the significance of predicted impacts.

The USFS, NPS, and USFWS have published their "Final FLAG Phase I Report" (Federal Register, Vol. 66 No. 2, dated January 3, 2001), providing "a consistent and predictable process for assessing the impacts of new and existing sources on AQRVs" including visibility. For example, the FLAG report states "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed", and further, "If the visibility impairment from the proposed action, in combination with cumulative new source growth, is less than a change in extinction of 10 percent (1.0 dv) for all time periods, the FLMs will not likely object to the proposed action".

The FLAG report also recommends a two-step analysis process to evaluate potential visibility impacts from either a single proposed air pollutant emission source (the seasonal FLAG screening method) or potential cumulative visibility impacts from a group of air pollutant emission sources (the daily FLAG refined method). As described in Argonne (2002), this NEPA analysis first used the seasonal FLAG "natural background" screening method (based on both the FLAG and WDEQ/AQD reference levels) to exclude those sensitive areas where visibility impacts were not likely to occur. Since no areas were excluded using the seasonal FLAG screening method, this NEPA analysis then applied the daily FLAG refined method (based on hourly background optical extinction and relative humidity values measured in both the Badlands and Bridger wilderness areas between 1989 and 1999) to determine the average number of days a 1.0 dv "just noticeable change" would be reached annually in each sensitive area. Although the use of observed hourly optical extinction and relative humidity values is appropriate in this NEPA analysis (where the potential visibility impacts are predicted to occur based on the reasonably foreseeable background conditions), EPA's Regional Haze Regulations are based on optical conditions reconstructed from $PM_{2.5}$ and PM_{10} data collected every third day under the IMPROVE program.

Estimation of Emission Factors: AP-42

Air quality impacts for various air pollutants are determined by the use of air dispersion models using specific source emission rates. For natural gas compressors, the emissions of nitrogen oxides are determined by the assumed

permitted emission rate allowed by the state. For fugitive dust impacts, emission rates are obtained from EPA's AP-42 document that is titled "Compilation of Air Pollutant Emission Factors". An AP-42 emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors may be appropriate to use in a number of situations such as making source-specific emission estimates for areawide inventories. These inventories have many purposes including ambient dispersion modeling and analysis, control strategy development, and in screening sources for compliance investigations. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all sources in a specific category.

Modeling Assumptions

When reviewing the predicted near- and far-field air quality impacts, it is important to understand that assumptions were made regarding development, emissions, meteorology, atmospheric transport and chemistry, and atmospheric deposition. For example, there is uncertainty regarding ultimate development of CBM in the Wyoming and Montana PRB (i.e., number of wells, equipment to be used, specific locations of wells, etc.).

The following assumptions were used in the analysis:

- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the assumed background concentration, plus the predicted maximum cumulative modeled concentrations, which may occur under different meteorological conditions.

- Assumed background air pollution concentrations were assumed to occur throughout the 20-year LOP at all locations in the region, even though monitoring is primarily conducted in urban or industrial areas, rather than rural areas. The uniform background PM_{10} levels for each state are assumed to be representative of the background conditions for the entire modeled area of the PRB, based on monitoring data gathered throughout northeastern Wyoming and southeastern Montana.

- The maximum predicted air quality impacts occur only in the vicinity of the anticipated emission sources. Actual impacts would likely be less at distances beyond the predicted points of maximum impact.

- All emission sources were assumed to operate at their reasonably foreseeable maximum emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the co-probability of such a scenario actually occurring over an entire year (or even 24-hours) is small.

- In developing the emissions inventory and model, there is uncertainty regarding ultimate oil and gas development (i.e., number of wells, equipment to be used, specific locations, etc.) Most (90 percent) proposed CBM wells and 30 percent of conventional wells were assumed to be fully operational and remain operating (no shut-ins) throughout the LOP.

- The total proposed booster (field) and pipeline (sales) compression engines were assumed to operate at their rated capacities continuously throughout the LOP (no phased increases or reductions). In reality, compression equipment would be added or removed incrementally as required by the well field operation, compressor engines would operate below full horsepower ratings, and it is unlikely all compressor stations would operate at maximum levels simultaneously.

- The HAP analyses assumed a 9,900 hp, six-unit, reciprocating compressor engine station would operate at full load and at maximum emission levels continuously throughout the LOP.

- The emissions inventory and model use peak years of construction and peak years of operations, which would not occur throughout the entire development region at the same time. However, it is possible that conditions close to this could occur in some isolated areas.

- The emissions inventory and model assumed a NO_x emission rate for compressor engines of 1.5 g/hp-hr in Montana and 1.0 g/hp-hr in Wyoming. Since BACT is decided on a case-by-case basis, actual emission rates could be decided to be less or more than this level by the Departments of Environmental Quality in Wyoming or Montana, and on Indian lands by EPA, for field and sales compressor engines. Actual NO_x emission rates may range from 0.7 to 2.0 g/hp-hr.

- There are no applicable local, state, tribal or federal acid deposition standards. In the absence of applicable standards, the acid deposition analysis assumed that a “limit of acceptable change” is: a 10 percent change in acid neutralizing capacity (ANC) for lakes with a background ANC greater than 25 µeq/L; or a 1.0 µeq/L change in ANC for lakes with a background ANC less than 25 µeq/L, and would be a reasonably foreseeable significant adverse impact. Further, the atmospheric deposition impact analysis assumed no other ecosystem components would affect lake chemistry for a full year (assuming no chemical buffering due to interaction with vegetation or soil materials).

- The visibility impact analysis assumed that a 1.0 dv “just noticeable change” would be a reasonably foreseeable significant adverse impact, although there are no applicable local, state, tribal, or federal regulatory visibility standards. However, some FLMs are using 0.5 dv as a screening threshold for significance.

- Mitigation measures are included in the emissions inventory and model that may not be achievable in all circumstances. However, actual mitigation decided by the developers and local and state authorities may be greater or less than those assumed in the analysis. For example, maintaining a construction road speed limit of 15 mph may be reasonable in a construction zone but difficult to enforce elsewhere. Full (100 percent) mitigation of fugitive dust from disturbed lands may not be achievable. Further, 50 percent reduction in fugitive emissions is assumed based on construction road wetting on the unimproved access road to the pad and at the pad, but this level of effectiveness is characterized as the maximum possible. Wetting was assumed for maintenance traffic, which is not likely to occur, but this is considered to be a small effect because of limited traffic.

- Induced or secondary growth related to increases in vehicle miles traveled (VMT) (believed to be on the order of 10 percent overall) is not included in the emissions inventory and model. Not all fugitive dust emissions (including county and other collector roads) have been included in the emissions inventory and model.

- Fugitive dust emissions from roads are treated as area sources rather than line sources in the model, which may thereby reduce or increase the predicted ambient concentrations at maximum concentration receptor points near the source, depending on the inputs to the model (meteorology, terrain, etc.) By not placing modeled receptors close to emission sources (e.g., wells and roads), the model may not capture higher ambient concentrations near these sources. A more refined, regulatory model may yield higher concentrations at locations near fugitive dust sources.

- For comparisons to the PSD Class I and II increments, the emissions inventory and model included only CBM and RFFD sources. Other existing increment consuming sources such as Campbell County coal mines were not included in this comparison, as the air quality analysis does not represent a regulatory PSD increment consumption analysis. A regulatory PSD increment consumption analysis needs to identify and consider all PSD increment consuming sources to determine the level of PSD Class II increment consumption. Monitoring data in Wyoming has indicated an upward trend in PM concentrations in Campbell County since 1999, which coincides with CBM development but is also exacerbated by prolonged drought in the region.

It is important to note that before actual development could occur, the applicable air quality regulatory agencies (including the state, tribe or EPA) would review specific air pollutant emissions preconstruction permit applications that examine potential project-specific air quality impacts. As part of these permit reviews (depending on source size), the air quality regulatory agencies could require additional air quality impact analyses or mitigation

measures. Thus, before development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality.

Modeling Results

The following Tables (H-4 through H-17) present the detailed atmospheric dispersion modeling results for the alternatives considered in the Wyoming PRB Oil and Gas Project EIS. These results are summarized in Section 4.8.4. As discussed in Section 4.8.4, the cumulative impacts predicted by the PRB air quality impact assessment would be the same under the Proposed Action and all of the Alternatives for leasing or not leasing federal coal considered in this EIS. This is because the air quality impact analysis used market demand predictions in order to estimate levels of coal production in the PRB for modeling purposes. There is enough coal leased to the existing mines in the PRB to supply this market demand during the time of maximum CBM development activity in the PRB, which is the time when the maximum overlapping impacts to air quality would occur.

Table H-4. Predicted Hazardous Air Pollutant Impacts and Significance Thresholds (in $\mu g/m^3$).

Pollutant	Averaging Time	Direct Modeled Impact	Range of State Acceptable Ambient Concentration Levels
formaldehyde	8-hours	**11.9**	**4.5** (FL07) - 71 (NV01)
n-hexane	8-hours	0.6	1,800 (FL07) - 36,000 (CT01)
benzene	8-hours	0.7	30 (FL04) - 714 (NV01)
toluene	8-hours	4.6	1,870 (IN03) - 8,930 (NV01)
ethyl benzene	8-hours	< 0.1	4,340 (ND01) - 43,500 (VT01)
xylene	8-hours	0.2	2,170 (IN01) - 10,400 (NV01)

Agencies:
CT01 - Connecticut Department of Environmental Protection; Air Compliance Unit
FL04 - Broward County Department of Natural Resource Protection (Florida)
FL07 - Pinellas County Air Pollution Control Board (Florida)
IN01 - Indiana Department of Environmental Management
IN03 - Indianapolis Air Pollution Control Division (Indiana)
ND01 - North Dakota Dept. of Health; Division of Environmental Engineering
NV01 - Nevada Division of Environmental Protection; Air Quality Control
VT01 - Vermont Dept of Environmental Conservation; Air Pollution Control Division

Table H-5. Wyoming PRB Oil and Gas Project EIS Alternative 1 - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m³).

Pollutant	Avg Time [a]	Location	Increment	Alt 1	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	223	142	224	3,500	3,724	40,000	40,000
		far-field [1]	- - -	5	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	156	124	156	1,500	1,656	10,000	10,000
		far-field [2]	- - -	19	70	78	1,500	1,578	10,000	10,000
nitrogen dioxide	Annual	near-field	25	8.0	3.3	10.5	17	27	100	100
		far-field [3]	25	0.4	5.1	5.4	17	22	100	100
		far-field [2]	2.5	0.3	**3.9** [b]	**4.2** [b]	17	21	100	100
$PM_{2.5}$	24-hours	near-field	- - -	16.0	8.6	24.4	19	43	65	65
		far-field [3]	- - -	5.1	9.7	14.7	19	34	65	65
	Annual	near-field	- - -	1.7	0.7	2.3	8	10	15	15
		far-field [3]	- - -	0.2	1.1	1.2	8	9	15	15
PM_{10}	24-hours	near-field	30	20.2	9.3	**30.8** [b]	42	73	150	150
		far-field [4]	30	0.5	29.7	29.7	42	72	150	150
		far-field [2]	8	3.9	**9.4** [b]	**12.8** [b]	42	55	150	150
		far-field [5]	8	2.2	7.0	9.2 [b]	42	51	150	150
	Annual	near-field	17	3.3	0.9	4.1	17	21	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	3.3	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.7	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	1.7	1.8	3.2	8	11	365	260
		far-field [3]	91	0.3	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.5	0.2	0.6	3	4	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.

[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, and that **Cum** emission sources could exceed the PSD Class I increment in the Washakie Wilderness Area, and the PSD Class II increment near the maximum potential development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate Air Quality Regulatory Agency.

Alt 1 - Direct modeled Wyoming PRB Oil and Gas EIS Alternative 1 impacts.

Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 1**, including projected surface coal mining in the Wyoming and Montana PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 1** and **Other** impacts, which can occur at different locations.

Total - The sum of the cumulative modeled impact and the assumed background concentration.

National - Applicable National Ambient Air Quality Standard.

Wyoming - Applicable Wyoming Ambient Air Quality Standard.

Locations:

1 Absaroka-Beartooth Wilderness Area
2 Northern Cheyenne Indian Reservation
3 Crow Indian Reservation
4 Fort Belknap Indian Reservation
5 Washakie Wilderness Area

Table H-6. Wyoming PRB Oil and Gas Project EIS Alternative 1 - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds.

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 1**	**Other**	**Cum**	**Thld**	**Alt 1**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/L)**	**Alt 1**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	69.0	0.7	1.9	2.6	10
		Deep	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	61.0	0.8	2.1	2.9	10
		Hobbs	<0.01	0.01	0.01	5	0.01	0.01	0.02	3	68.0	0.4	1.1	1.5	10
		Upper Frozen	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	5.8[a]	0.5 [a]	**1.3** [a]	**1.8** [a]	1 [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	0.01	0.02	0.02	3	61.4	0.5	1.6	2.1	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	0.01	0.03	0.03	3	27.0	0.3	2.2	2.5	10
		Twin Island	<0.01	0.02	0.02	5	0.01	0.03	0.03	3	36.0	0.2	1.6	1.8	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.04	0.07	0.10	3	53.3	1.7	4.2	5.9	10
		Florence	<0.01	0.03	0.03	5	0.04	0.07	0.11	3	32.7	3.1	7.2	**10.4** [b]	10 [b]
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	0.01	0.02	0.04	3	55.5	1.0	2.6	3.6	10

Alt 1 - Direct modeled **Wyoming PRB Oil and Gas Project EIS** Alternative 1 impacts.
Other -Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 1**, including projected surface coal mining in the Wyoming and Montana PRB the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 1** and **Other** impacts.
Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from USFS (2000).
WA - Wilderness Area.
[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/L, the applicable significance threshold is less than a 1.0 µeq/L change. This threshold is exceeded by **Other** and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.
[b] Potential changes in acid neutralizing capacity is predicted to exceed the applicable significance level by less than one percent due to **Cum** emission sources.

Table H-7. Wyoming PRB Oil and Gas Project EIS Alternative 1 - Daily FLAG Refined Method - Visibility Impact Analysis (number of days 1.0 dv per year).

Sensitive Location	PSD Classification	Alt 1	Other	Cum
Badlands WA	mandatory federal Class I	3	13 to 17	24 to 28
Bridger WA	mandatory federal Class I	4	7 to 9	10 to 12
Fitzpatrick WA	mandatory federal Class I	4	6 to 9	10 to 12
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	1	3 to 5	6 to 8
North Absaroka WA	mandatory federal Class I	4	9 to 13	12 to 15
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	1 to 3
Scapegoat WA	mandatory federal Class I	0	2 to 2	3 to 3
Teton WA	mandatory federal Class I	3	6 to 9	10 to 11
Theodore Roosevelt NMP (N)	mandatory federal Class I	0	0 to 1	2 to 3
Theodore Roosevelt NMP (S)	mandatory federal Class I	1	1 to 3	4 to 7
U.L. Bend WA	mandatory federal Class I	1	4 to 5	6 to 8
Washakie WA	mandatory federal Class I	5	10 to 14	15 to 18
Wind Cave NP	mandatory federal Class I	4	17 to 21	28 to 32
Yellowstone NP	mandatory federal Class I	3	8 to 11	11 to 13
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 5
Northern Cheyenne IR	Tribal designated Class I	17	27 to 82	42 to 92
Absaroka-Beartooth WA	federal Class II	4	28 to 32	30 to 33
Agate Fossil Beds NM	federal Class II	2	8 to 11	15 to 19
Bighorn Canyon NRA	federal Class II	9	17 to 30	23 to 34
Black Elk WA	federal Class II	4	17 to 20	26 to 31
Cloud Peak WA	federal Class II	13	17 to 30	30 to 39
Crow IR	federal Class II	20	59 to 108	69 to 116
Devils Tower NM	federal Class II	9	17 to 25	39 to 47
Fort Belknap IR	federal Class II	1	60 to 61	61 to 62
Fort Laramie NHS	federal Class II	2	10 to 14	17 to 20
Jewel Cave NM	federal Class II	4	19 to 23	32 to 36
Mount Rushmore NMem	federal Class II	3	13 to 17	22 to 26
Popo Agie WA	federal Class II	4	7 to 9	10 to 13
Soldier Creek WA	federal Class II	2	10 to 13	18 to 21

Alt 1 - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 1 impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 1**, including projected surface coal mining operations in the Montana and Wyoming PRB and the Montana Statewide EIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).
Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 1** and **Other** impacts, which can occur at different locations.
Locations:
IR - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table H-8. Wyoming PRB Oil and Gas Project EIS Alternative 2A - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m³).

Pollutant	Avg Time [a]	Location	Increment	Alt 2A	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	158	142	197	3,500	3,697	40,000	40,000
		far-field [1]	- - -	4	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	93	124	132	1,500	1,632	10,000	10,000
		far-field [2]	- - -	14	70	76	1,500	1,576	10,000	10,000
nitrogen dioxide	Annual	near-field	25	7.2	3.3	9.6	17	27	100	100
		far-field [3]	25	0.4	5.1	5.4	17	22	100	100
		far-field [2]	**2.5**	0.2	**3.9** [b]	**4.1** [b]	17	21	100	100
$PM_{2.5}$	24-hours	near-field	- - -	13.0	8.6	21.3	19	40	65	65
		far-field [3]	- - -	4.5	9.7	14.0	19	33	65	65
	Annual	near-field	- - -	1.5	0.7	2.1	8	10	15	15
		far-field [3]	- - -	0.2	1.1	1.2	8	9	15	15
PM_{10}	24-hours	near-field	30	17.5	9.3	27.7	42	70	150	150
		far-field [4]	30	0.4	29.7	29.7	42	72	150	150
		far-field [2]	**8**	3.4	**9.4** [b]	**12.4** [b]	42	54	150	150
		far-field [5]	**8**	1.8	7.0	**8.8** [b]	42	51	150	150
	Annual	near-field	7	3.1	0.9	3.9	17	21	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	3.3	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.7	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	1.7	1.8	3.2	8	11	365	260
		far-field [3]	91	0.3	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.5	0.2	0.6	3	4	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.
[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, and that **Cum** emission sources could exceed the PSD Class I increment in the Washakie Wilderness Area; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate Air Quality Regulatory Agency.
Alt 2A - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 2A impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 2A**, including projected surface coal mining operations in the Montana and Wyoming PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 2A** and **Other** impacts, which can occur at different locations.
Total The sum of the cumulative modeled impact and the assumed background concentration.
National - Applicable National Ambient Air Quality Standard.
Wyoming - Applicable Wyoming Ambient Air Quality Standard.
Locations:
[1] Absaroka-Beartooth Wilderness Area
[2] Northern Cheyenne Indian Reservation
[3] Crow Indian Reservation
[4] Fort Belknap Indian Reservation
[5] Washakie Wilderness Area

Table H-9. Wyoming PRB Oil and Gas Project EIS Alternative 2A - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds.

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 2A**	**Other**	**Cum**	**Thld**	**Alt 2A**	**Other**	**Cum**	**Thld**	**Bkgd ()eq/l)**	**Alt 2A**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	69.0	0.6	1.9	2.5	10
		Deep	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	61.0	0.7	2.1	2.8	10
		Hobbs	<0.01	0.01	0.01	5	0.01	0.01	0.02	3	68.0	0.3	1.1	1.5	10
		Upper Frozen	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	5.8[a]	0.5 [a]	**1.3** [a]	**1.8** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	0.01	0.02	0.02	3	61.4	0.5	1.6	2.0	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	27.0	0.3	2.2	2.5	10
		Twin Island	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	36.0	0.2	1.6	1.8	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	53.3	1.5	4.2	5.7	10
		Florence	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	32.7	2.8	7.2	10.0	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	55.5	0.9	2.6	3.5	10

Alt 2A - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 2A impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 2A**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 2A** and **Other** impacts.
Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from USFS (2000).
WA - Wilderness Area.
[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/L change. This threshold is exceeded by **Other** and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

Table H-10. Wyoming PRB Oil and Gas EIS Alternative 2A - Daily FLAG Refined Method - Visibility Impact Analysis (number of days 1.0 dv per year)

Sensitive Location	PSD Classification	Alt 2A	Other	Cum
Badlands WA	mandatory federal Class I	3	13 to 17	24 to 27
Bridger WA	mandatory federal Class I	4	7 to 9	10 to 12
Fitzpatrick WA	mandatory federal Class I	3	6 to 9	9 to 12
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	1	3 to 5	6 to 7
North Absaroka WA	mandatory federal Class I	3	9 to 13	12 to 14
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	1 to 3
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	3	6 to 9	9 to 11
Theodore Roosevelt NMP (N)	mandatory federal Class I	0	0 to 1	2 to 3
Theodore Roosevelt NMP (S)	mandatory federal Class I	0	1 to 3	4 to 6
U.L. Bend WA	mandatory federal Class I	1	4 to 5	5 to 8
Washakie WA	mandatory federal Class I	4	10 to 14	14 to 18
Wind Cave NP	mandatory federal Class I	3	17 to 21	27 to 30
Yellowstone NP	mandatory federal Class I	2	8 to 11	11 to 13
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 5
Northern Cheyenne IR	Tribal designated Class I	16	27 to 82	39 to 91
Absaroka-Beartooth WA	federal Class II	3	28 to 32	29 to 33
Agate Fossil Beds NM	federal Class II	1	8 to 11	14 to 17
Bighorn Canyon NRA	federal Class II	8	17 to 30	22 to 34
Black Elk WA	federal Class II	3	17 to 20	25 to 29
Cloud Peak WA	federal Class II	12	17 to 30	28 to 38
Crow IR	federal Class II	16	59 to 108	69 to 115
Devils Tower NM	federal Class II	6	17 to 25	36 to 44
Fort Belknap IR	federal Class II	1	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	2	10 to 14	17 to 19
Jewel Cave NM	federal Class II	3	19 to 23	30 to 35
Mount Rushmore Nmem	federal Class II	2	13 to 17	21 to 25
Popo Agie WA	federal Class II	3	7 to 9	10 to 12
Soldier Creek WA	federal Class II	1	10 to 13	17 to 21

Alt 2A - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 2A impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in Wyoming PRB Oil and Gas Project EIS **Alt 2A**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).
Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 2A** and **Other** impacts, which can occur at different locations.
Locations:
IR - Indian Reservation **NHS** - National Historic Site **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table H-11. Wyoming PRB Oil and Gas Project EIS Alternative 2B - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m^3).

Pollutant	Avg Time [a]	Location	Increment	Alt 2B	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	157	142	170	3,500	3,670	40,000	40,000
		far-field [1]	- - -	3	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	77	124	124	1,500	1,624	10,000	10,000
		far-field [2]	- - -	9	70	74	1,500	1,574	10,000	10,000
nitrogen dioxide	Annual	near-field	25	6.3	3.3	8.8	17	26	100	100
		far-field [3]	25	0.3	5.1	5.3	17	22	100	100
		far-field [2]	**2.5**	0.2	3.9 [b]	**4.1** [b]	17	21	100	100
$PM_{2.5}$	24-hours	near-field	- - -	10.7	8.6	19.0	19	38	65	65
		far-field [3]	- - -	3.8	9.7	13.4	19	32	65	65
	Annual	near-field	- - -	1.3	0.7	2.0	8	10	15	15
		far-field [3]	- - -	0.1	1.1	1.2	8	9	15	15
PM_{10}	24-hours	near-field	30	15.2	9.3	25.5	42	67	150	150
		far-field [4]	30	0.4	29.7	29.7	42	72	150	150
		far-field [2]	**8** [b]	3.0	9.4 [b]	**12.1** [b]	42	54	150	150
		far-field [5]	**8**	1.5	7.0	8.5 [b]	42	50	150	150
	Annual	near-field	17	2.9	0.9	3.7	17	21	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	3.3	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.7	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	1.7	1.8	3.2	8	11	365	260
		far-field [3]	91	0.3	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.5	0.2	0.6	3	4	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.
[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, and that **Cum** emission sources could exceed the PSD Class I increment in the Washakie Wilderness Area; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate Air Quality Regulatory Agency.
Alt 2B - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 2B impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 2B**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 2B** and **Other** impacts, which can occur at different locations.
Total - The sum of the cumulative modeled impact and the assumed background concentration.
National - Applicable National Ambient Air Quality Standard.
Wyoming - Applicable Wyoming Ambient Air Quality Standard.
Locations:
[1] Absaroka-Beartooth Wilderness Area
[2] Northern Cheyenne Indian Reservation
[3] Crow Indian Reservation
[4] Fort Belknap Indian Reservation
[5] Washakie Wilderness Area

Table H-12. Wyoming PRB Oil and Gas Project EIS Alternative 2B - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds.

			Total Sulfur Deposition (kg/ha-yr)				**Total Nitrogen Deposition (kg/ha-yr)**				**Acid Neutralizing Capacity (percent)**				
Location	**PSD Class**	**Lake**	**Alt 2B**	**Other**	**Cum**	**Thld**	**Alt 2B**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/l)**	**Alt 2B**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	69.0	0.6	1.9	2.4	10
		Deep	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	61.0	0.6	2.1	2.7	10
		Hobbs	<0.01	0.01	0.01	5	<0.01	0.01	0.02	3	68.0	0.3	1.1	1.4	10
		Upper Frozen	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	5.8 [a]	0.4 [a]	**1.3** [a]	**1.7** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	0.01	0.02	0.02	3	61.4	0.4	1.6	2.0	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	27.0	0.2	2.2	2.5	10
		Twin Island	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	36.0	0.2	1.6	1.8	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	53.3	1.3	4.2	5.5	10
		Florence	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	32.7	2.5	7.2	9.7	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	55.5	0.8	2.6	3.4	10

Alt 2B - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 2B impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 2B**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 2B** and **Other** impacts.
Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from USFS (2000).
WA- Wilderness Area.
[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by **Other** sources alone, as well **Cum** sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

Table H-13. Wyoming PRB Oil and Gas Project EIS Alternative 2B - Daily FLAG Refined Method - Visibility Impact Analysis (number of days 1.0 dv per year).

Sensitive Location	PSD Classification	Alt 2B	Other	Cum
Badlands WA	mandatorv federal Class I	1	13 to 17	22 to 26
Bridger WA	mandatory federal Class I	3	7 to 9	9 to 11
Fitzpatrick WA	mandatory federal Class I	3	6 to 9	9 to 11
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	0	3 to 5	5 to 7
North Absaroka WA	mandatory federal Class I	2	9 to 13	12 to 14
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	1 to 2
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	2	6 to 9	9 to 11
Theodore Roosevelt NMP (N)	mandatory federal Class I	0	0 to 1	1 to 3
Theodore Roosevelt NMP (S)	mandatory federal Class I	0	1 to 3	3 to 6
U.L. Bend WA	mandatory federal Class I	1	4 to 5	5 to 7
Washakie WA	mandatory federal Class I	4	10 to 14	14 to 17
Wind Cave NP	mandatory federal Class I	2	17 to 21	25 to 28
Yellowstone NP	mandatory federal Class I	1	8 to 11	11 to 13
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 4
Northern Cheyenne IR	Tribal designated Class I	14	27 to 82	38 to 90
Absaroka-Beartooth WA	federal Class II	3	28 to 32	29 to 33
Agate Fossil Beds NM	federal Class II	0	8 to 11	3 to 16
Bighorn Canyon NRA	federal Class II	7	17 to 30	21 to 33
Black Elk WA	federal Class II	2	17 to 20	24 to 28
Cloud Peak WA	federal Class II	9	17 to 30	27 to 37
Crow IR	federal Class II	14	59 to 108	68 to 115
Devils Tower NM	federal Class II	5	17 to 25	34 to 42
Fort Belknap IR	federal Class II	1	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	1	10 to 14	16 to 19
Jewel Cave NM	federal Class II	2	19 to 23	29 to 33
Mount Rushmore Nmem	federal Class II	1	13 to 17	21 to 24
Popo Agie WA	federal Class II	3	7 to 9	10 to 12
Soldier Creek WA	federal Class II	1	10 to 13	16 to 20

Alt 2B - Direct modeled Wyoming PRB Oil and Gas EIS Alternative 2B impacts.
Other- Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 2B**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).
Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 2B** and **Other** impacts, which can occur at different locations.
Locations:
IR - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table H-14. Wyoming PRB Oil and Gas Project EIS Alternative 3 - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m³).

Pollutant	Avg Time[a]	Location	Increment	Alt 3	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	261	142	261	3,500	3,761	40,000	40,000
		far-field [1]	- - -	2	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	183	124	183	1,500	1,683	10,000	10,000
		far-field [2]	- - -	8	70	75	1,500	1,575	10,000	10,000
nitrogen dioxide	Annual	near-field	25	3.0	3.3	5.8	17	23	100	100
		far-field [3]	25	0.3	5.1	5.3	17	22	100	100
		far-field [2]	**2.5**	0.1	**3.9** [b]	**4.1** [b]	17	21	100	100
$PM_{2.5}$	24-hours	near-field	- - -	5.7	8.6	13.5	19	32	65	65
		far-field [4]	- - -	0.2	12.7	12.7	19	32	65	65
	Annual	near-field	- - -	0.7	0.7	1.3	8	9	15	15
		far-field [4]	- - -	0.0	1.2	1.2	8	9	15	15
PM_{10}	24-hours	near-field	30	7.1	9.3	15.6	42	58	150	150
		far-field [4]	30	0.2	29.7	29.7	42	72	150	150
		far-field [2]	**8**	1.5	**9.4** [b]	**10.7** [b]	42	53	150	150
		far-field [5]	8	0.9	7.0	7.8	42	50	150	150
	Annual	near-field	17	1.2	0.9	1.9	17	19	50	50
		far-field [4]	7	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	1.2	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.3	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	0.6	1.8	2.2	8	10	365	260
		far-field [3]	91	0.1	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.2	0.2	0.3	3	3	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.
[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate Air Quality Regulatory Agency.
Alt 3 - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 3 impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 3**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 3** and **Other** impacts, which can occur at different locations.
Total - The sum of the cumulative modeled impact and the assumed background concentration.
National - Applicable National Ambient Air Quality Standard.
Wyoming - Applicable Wyoming Ambient Air Quality Standard.
Locations:
[1] Absaroka-Beartooth Wilderness Area
[2] Northern Cheyenne Indian Reservation
[3] Crow Indian Reservation
[4] Fort Belknap Indian Reservation
[5] Washakie Wilderness Area

Table H-15. Wyoming PRB Oil and Gas Project EIS Alternative 3 - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds.

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 3**	**Other**	**Cum**	**Thld**	**Alt 3**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/l)**	**Alt 3**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	<0.01	0.02	0.03	3	69.0	0.3	1.9	2.1	10
		Deep	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	61.0	0.3	2.1	2.4	10
		Hobbs	<0.01	0.01	0.01	5	<0.01	0.01	0.02	3	68.0	0.2	1.1	1.3	10
		Upper Frozen	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	5.8 [a]	0.2 [a]	**1.3** [a]	**1.5** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	61.4	0.2	1.6	1.7	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	27.0	0.1	2.2	2.4	10
		Twin Island	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	36.0	0.1	1.6	1.7	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.01	0.07	0.08	3	53.3	0.7	4.2	4.9	10
		Florence	<0.01	0.03	0.03	5	0.02	0.07	0.08	3	32.7	1.3	7.2	8.5	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	<0.01	0.02	0.03	3	55.5	0.4	2.6	3.0	10

Alt 3 - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 3 impacts.
Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 3**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.
Cum Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 3** and **Other** impacts.
Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from USFS (2000).
WA - Wilderness Area.
[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/L, the applicable significance threshold is less than a 1 µeq/L change. This threshold is exceeded by **Other** sources alone, as well **Cum** sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

Table H-16. Wyoming PRB Oil and Gas Project EIS Alternative 3 - Daily FLAG Refined Method - Visibility Impact Analysis (number of days 1.0 dv per year).

Sensitive Location	PSD Classification	Alt 3	Other	Cum
Badlands WA	mandatory federal Class I	0	13 to 17	18 to 21
Bridger WA	mandatory federal Class I	1	7 to 9	8 to 10
Fitzpatrick WA	mandatory federal Class I	1	6 to 9	8 to 10
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	3 to 4
Grand Teton NP	mandatory federal Class I	0	3 to 5	4 to 6
North Absaroka WA	mandatory federal Class I	0	9 to 13	11 to 13
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	0 to 2
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	0	6 to 9	7 to 10
Theodore Roosevelt NMP (N)	mandatory federal Class I	0	0 to 1	1 to 2
Theodore Roosevelt NMP (S)	mandatory federal Class I	0	1 to 3	2 to 4
U.L. Bend WA	mandatory federal Class I	0	4 to 5	5 to 6
Washakie WA	mandatory federal Class I	1	10 to 14	12 to 16
Wind Cave NP	mandatory federal Class I	0	17 to 21	22 to 25
Yellowstone NP	mandatory federal Class I	0	8 to 11	9 to 12
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 4
Northern Cheyenne IR	Tribal designated Class I	7	27 to 82	33 to 87
Absaroka-Beartooth WA	federal Class II	0	28 to 32	28 to 32
Agate Fossil Beds NM	federal Class II	0	8 to 11	10 to 14
Bighorn Canyon NRA	federal Class II	3	17 to 30	19 to 32
Black Elk WA	federal Class II	0	17 to 20	20 to 24
Cloud Peak WA	federal Class II	3	17 to 30	23 to 35
Crow IR	federal Class II	10	59 to 108	65 to 113
Devils Tower NM	federal Class II	1	17 to 25	26 to 34
Fort Belknap IR	federal Class II	0	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	0	10 to 14	13 to 16
Jewel Cave NM	federal Class II	0	19 to 23	24 to 28
Mount Rushmore NMem	federal Class II	0	13 to 17	17 to 20
Popo Agie WA	federal Class II	1	7 to 9	8 to 11
Soldier Creek WA	federal Class II	0	10 to 13	13 to 16

Alt 3 - Direct modeled Wyoming PRB Oil and Gas Project EIS Alternative 3 impacts.

Other - Direct modeled "Reasonably Foreseeable Development" impacts. The impact from all air pollutant emission sources not included in **Alt 3**, including projected surface coal mining operations in the Wyoming and Montana PRB and the Montana Statewide EIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).

Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 3** and **Other** impacts, which can occur at different locations.

Locations:

IR - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table H-17. Predicted Visibility Impacts in Class I Areas - Daily FLAG Refined Method (Maximum cumulative deciview change).

Class I area	Alt 1	Alt 2	Alt 2b	Alt 3
Badlands Wilderness Area[1]	10.91	10.67	10.43	9.46
Bridger Wilderness Area	13.28	12.67	12.21	11.15
Fitzpatrick Wilderness Area	16.57	15.83	15.21	14.01
Gates of the Mtns Wilderness Area	14.99	14.61	14.22	13.17
Grand Teton National Park	6.95	6.67	6.44	5.8
North Absaroka Wilderness Area	14.89	14.12	13.51	12.21
Red Rock Lakes Wilderness Area	2.85	2.75	2.67	2.37
Scapegoat Wilderness Area	9.89	9.58	9.35	8.55
Teton Wilderness Area	14.59	13.97	13.46	12.38
Theodore Roosevelt NMP[2] (North Unit)	3.65	3.46	3.29	2.75
Theodore Roosevelt NMP[2] (South Unit)	4.62	4.37	4.14	3.51
U.L. Bend Wilderness Area	29.05	27.97	26.97	24.01
Washakie Wilderness Area	24.79	23.82	22.96	21.48
Wind Cave National Park	9.05	8.81	8.59	8.06
Yellowstone National Park	12.79	12.19	11.59	10.25
Northern Cheyenne Reservation[3]	54.75	52.8	50.71	45.02

1 The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory federal PSD Class I area. The remainder of Badlands National Park is a PSD Class II area.

2 NMP – National Memorial Park.

3 Although the Northern Cheyenne Reservation is a tribal designated PSD Class I Area, it is not a mandatory federal PSD Class I area subject to EPA's Regional Haze Regulations.

Mitigation Options

Mitigation may be applied to fugitive dust and nitrogen oxide (NO_x) impacts. Fugitive dust refers to any particulate matter that is not deliberately emitted by a well-defined source. Fugitive dust sources typically include windblown dust from unvegetated lands and unpaved roads. Table H-18 shows several fugitive dust mitigation options available. Other mitigation measures that are utilized by surface coal mines in Wyoming to control fugitive dust emissions are listed in Section 3.4.5.5

Nitrogen oxide emissions are associated with combustion. Table H-19 shows several options available to mitigate NO_x impacts related to production of oil and gas, including CBM. Mitigation measures that the mines have instituted or that WDEQ may require related to coal mining operations are listed in Section 3.4.5.6.

Table H-18. Fugitive Dust Mitigation Measures (PM_{10}), Effectiveness and Cost.

	Dust Sources					
	Disturbed Areas	**Unpaved Roads[1]**				
Mitigation Options	Establish plant cover for all disturbed lands by certain time (re-vegetation)	Water roads to attain certain percent moisture[2]	Apply soil stabilizer	Set and enforce speed limit	Gravel roads	Pave road
Effectiveness	Level proportional to percentage of land cover	0 - 50 percent reduction in uncontrolled dust emissions	33 to 100 percent control efficiency	80 percent for 15 mph[3] 65 percent for 20 mph[3] 25 percent for 30 mph[3]	30 percent reduction	90 percent reduction
Estimated Cost		$4000/mile	$2,000 to $4,000/mile per year	Unknown	$9,000/mile	$11,000 to $60,000/mile

1 Improved and County roads.

2 Wetting of construction roads during the construction period. Wetting of construction roads not required for once a month maintenance trips to well pads.

3 Reductions assume 40 mile per hour base speed.

Table H-19. Nitrogen Oxides (NO_x) Mitigation Measures Efficiency.

	NO_x Emissions Sources			
	Field Compressors	**Sales Compressors**	**Temporary Diesel Generators[1]**	
Mitigation Options/Efficiency	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Register with State; WDEQ regulate as appropriate	Voluntary use of diesel engines

1 Wyoming is currently registering these generators to determine if NO_x emissions are significant.

2 BACT could include electric compression.

APPENDIX I

COMMENT LETTERS ON THE
DRAFT EIS AND RESPONSES

P&M LAND EXCHANGE
RESPONSES TO COMMENTS RECEIVED ON THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Comment Response 1: Letters 1-A, 1-B, 4, 14, 9, 11, 12, 13
Underground Coal Seam Fire on the Welch Lands

The underground coal seam fire on the Welch lands was very briefly mentioned on page 3-9 of the Draft EIS, but the location was incorrectly stated. While the fire was not identified as a topic of concern in the scoping comments or during the scoping meetings that were held in March of 2001, comments on the underground fire were received just prior to the distribution of the Draft EIS and concerns about the fire were included in several comment letters received on the Draft EIS. In response to the concerns expressed in those comments, BLM personnel have conducted site visits, reviewed aerial photography, talked with some of the local residents, researched the available information on the fire, and prepared a technical report concerning the fire. BLM's technical report is included as Appendix D of this Final EIS. An expanded discussion and maps of the fire can also be found in Section 3.3 of this document and a brief summary of the information in the technical report is presented here in response to the underground fire-related comments received on the Draft EIS.

The underground coal fire is located on a hillside between and north of two draws along the west bank of the Tongue River in the southwest quarter of Section 2, T.57N., R.84W. Based on field surveys conducted by BLM personnel using a GPS unit, the treeless area associated with the fire covers approximately 13 acres (or about 0.8 percent) of the (approximately) 1,600 acre Welch lands offered by P&M for exchange. The coal underlying the upper part of the hillside appears to be actively burning, as evidenced by fissures several feet deep. Gas readings in the fissures showed elevated levels of methane and carbon monoxide and depleted levels of oxygen.

There are three coal beds present below the surface of the hillside. In descending order, these coal beds are the Dietz 2, Dietz 3, and Monarch coal beds. The Dietz 2 bed is approximately 8 feet thick and has partially burned in prehistoric times to form clinker near the top of the hill. The Dietz 3 bed, which appears to be the main zone that is burning, is approximately 26 feet thick and is separated from the Dietz 2 bed by 80 to 90 feet of shale, siltstone, sandstone, and thin coal beds. The Monarch bed is about 16 feet thick and is separated from the Dietz 3 coal seam by 15 to 40 feet of shale, siltstone and sandstone. The Monarch has burned or is burning over a large area south of the Welch lands, but data are lacking as to whether it is burning or has burned at this site.

The fire on the Welch lands is probably related to an underground fire at the abandoned Acme No. 42 underground coal mine. The mine actively mined the

Monarch coal seam south of and on the Welch lands from about 1911 through 1940. Maps obtained from OSM's Mine Map repository indicate that most of the Monarch coal seam in the SE/4 SE/4 of Section 3, T.57N. R.84W., which is on the Welch lands, was mined. A prehistoric burn line kept the mine from advancing further north. Collapse of the mined out rooms between the pillars in the old underground mine workings allowed air inflow and some of the remaining unmined coal in the Monarch bed began burning sporadically. As the fire in the mined-out areas advanced, the overlying sediments and coal beds collapsed, and the fire may have spread to the overlying Dietz 2 and Dietz 3 coal beds through the fissures created by the collapse. Sporadic underground coal fires have been burning in the area of the Acme mine for at least the past 60 years. Based on a comparison of the mined-out area and what is known about the extent of the fire area in the 1940s, 1978, 1987, and the area of current burning in Section 2, BLM estimated that the fire has moved north several hundred feet in the past 24 years. The fire might also be related to collapse of underground workings at the Evans mine, where coal was mined for domestic use prior to 1909, as mentioned by Taff in USGS Bulletin 341-B. That publication reports an Evans mine along the west bank of the Tongue River in the south half of Section 2, T.57N., R.84W. A report prepared by Spectrum Engineering (2002) states: "The underground fire has now moved approximately a quarter of a mile north from the mine. If the fire continues to the north, it will reach the Dietz 3 outcrop on the opposite side of the ridge within 800 feet." The coal seam fire will probably continue to burn northward and westward until: 1) it runs out of coal, either by hitting an outcrop or prehistoric burn line; 2) the supply of oxygen is cut off because fissures fail to reach the surface; 3) the coal drops below the water table; or 4) the area is fully reclaimed. Burning could continue for tens to hundreds of years. At the present rate and direction of fire advance, the coal fire is not likely to affect the majority of the Welch lands in the foreseeable future.

Although mined-out areas extend underneath the Welch lands in SE/4 SE/4 of Section 3 and the W/2 SW/4 SW/4 of Section 2, a surface inspection in the fall of 2002 by BLM staff did not reveal any active fires in those areas. Future fires could occur in mined areas where subsidence has exposed coal to air and heat.

Comment Response 2: Letters 1-A, 1-B, 4, 9, 11, 12, 13
Thunder Child Fire

In July of 2001, a wildland fire started in the S/2 of Section 2, T.57N., R.84W. The fire, known as the Thunder Child fire, was reported on July 28, 2001 and declared out on August 3, 2001. The fire burned approximately 5,207 acres. Most of the area that was burned was privately owned. As of November 2001, the Sheridan Fire-Rescue Department lists the cause of the fire as undetermined, but identifies possible causes as lightning, the underground coal seam fire on the Welch lands, and human action.

Mr. Frank Mommsen, a landowner in this area submitted comments on the P&M Exchange and the Draft EIS stating that the fire was caused by the coal seam fire. Mr. Mommsen obtained reports from an Internet lightning detection service showing that there were no lightning strikes in this area in the time frame when the fire started. Another nearby landowner said that lightning strikes did occur in this area the day the Thunder Child fire started. The issue of the origin of the Thunder Child fire remains unresolved.

Comment Response 3: Letters 1-A, 3, 11, 12, 14
Management Options if BLM Acquires the Underground Coal Seam Fire

The BLM *Technical Report on the Welch Ranch Coal Fire*, included as Appendix D of this Final EIS, identifies and discusses several options that the BLM is considering related to changing the configuration of the Welch lands if the BLM's decision, following the completion of this environmental analysis and the completion of the public interest determination, is to proceed with an exchange. The options that BLM is considering range from completing an exchange for all of the offered Welch lands (approximately 1,600 acres) to deleting up to 210 acres from the Welch lands that BLM would acquire. The 210 acres that would be deleted from the tract includes a 40-acre parcel containing the fire plus a 60-acre parcel containing the area that was previously mined plus an additional 110-acre buffer zone.

Appendix D also discusses several options for managing the fire if BLM's decision, after completion of the environmental analysis and public interest determination, is to proceed with acquisition of all of the Welch lands offered for exchange by P&M. These options range from reclaiming the fire or completely fencing off the coal seam fire area from public access and posting warning signs, to managing and monitoring the fire for research or showcasing the area as an example of coal seam burning processes. Although the origin of this particular fire is probably due to collapse of a nearby old underground coal mine, natural, spontaneous coal seam fires have occurred extensively in this area and other parts of the Powder River Basin in Wyoming and Montana in the past. Prehistoric natural coal fires have resulted in the formation of extensive clinker deposits that provide important recharge zones for aquifers as well as important habitat areas for wildlife. If the exchange is completed as proposed and BLM acquires all of the Welch lands, management will be determined in a future planning action by the BLM Buffalo Field Office.

There are examples of burning coal seams located on other federal lands and managed by other agencies. At Theodore Roosevelt National Park in North Dakota, the National Park Service had a burning coal vein nature trail associated with a coal fire that started by lightning in the 1950s and burned until 1972. In the Little Missouri National Grassland, also in North Dakota, there are burning coal veins that ignite due to range fires and lightning. The

Forest Service has managed these sites by both digging out and isolating the burning veins and by fencing off the fires and posting signs.

Comment Response 4: Letters 1-B, 4, 11, 13
AML Actions to Control Underground Coal Seam Fires

A coal fire is eligible for full reclamation funding through Wyoming AMLD's SMCRA program, regardless of whether it is on public or private land, if:

1) the fire is the result of historic coal mining activity that occurred prior to the eligibility dates established in SMCRA;
2) the fire constitutes an extreme danger or potential adverse effect to public health, safety and property;
3) there is no responsible party with outstanding reclamation obligations for the site; and
4) the permittee has not re-disturbed the site after the eligibility date if the site is located within the boundaries of an active coal mine permit area. Currently, the area of the Welch fire is within the active permit area of the proposed Welch No. 1 North mine.

This program is funded through a 35 cent-per-ton reclamation fee collected by OSM from producing coal mines.

The Wyoming AMLD has done several reclamation and emergency rehabilitation projects to extinguish fires in the area of the abandoned Acme No. 42 underground coal mine during the past twenty years. In 1987, the Wyoming AMLD extinguished and reclaimed coal fires that were advancing upstream in a drainage located in the NE/4 of Section 10, T.57N., R.84W., south of the Welch lands. In September 2002, contractors for the Wyoming AMLD worked to stabilize the north end of the fire on the Welch lands. Smaller cracks on the hillside were excavated and filled with scoria (clinker) fines and country rock; larger cracks were filled with a slurry of scoria fines and water. The surface was then regraded. Vapor rising from bare spots observed during tours of the site in February 2003 by BLM personnel and by a WDEQ inspector indicate that the coal is still smoldering at depth.

The AMLD prioritizes all potential reclamation sites based on the level of hazard, accessibility to the public, and budgetary constraints. In the case of mine fires, AMLD involvement may depend on the degree to which success is expected in controlling or extinguishing the fire.

Comment Response 5: Letter 2

BLM received the following information from Fred Fouse, a USFS wildlife biologist in response to the Comment Letter 2. This information was incorporated into the Final EIS.

Paragraph 2: In addition to the big game species mentioned, there are, as Mr. Hunzie states, a lot of antelope in that area and they have many fawns with them this year.

Paragraph 3: It is not unlikely that grizzly bears might incidentally be present in the general vicinity. However, regular occupancy, including sows with cubs, is not confirmed at this time. Grizzlies that might move into or through the area would most likely be dispersing young adult males, most of which could be expected to be transients. Young females often establish home ranges adjacent or near to their mothers. Young males are more likely to disperse greater distances in search of home ranges not already occupied by older males. For the most part, it is the young males that are in the vanguard of the expanding grizzly bear population. Sightings of these do not necessarily mean they are residents, although they certainly could be.

The Kemmerer Ranger District is not likely to become regularly occupied grizzly bear range, including sows with cubs, as long as there are active grazing allotments for domestic sheep. This is a small area for grizzlies and they are prone to prey on sheep. The loss of bears through depredation conflicts could prevent establishment of a local breeding population.

There is confirmed evidence of grizzly bear movement southward. On 8/15/02 it was announced there is an ongoing investigation into the death of a grizzly bear on the Greys River District, some 30 miles south of the designated Grizzly Bear Recovery Zone.

Paragraph 4: Similar to the situation with the grizzly bear, transitory wolf presence is likely, but pack establishment and reproduction is not confirmed. Wolves are very long range dispersers and their presence is highly likely. However, there is no confirmed pack activity at this time at the south end of the Kemmerer Ranger District. Once a pack is established, my experience has been they are rather conspicuous. There will be numerous sightings on a regular basis rather than very scattered reports.

Mr. Fouse suggested that both grizzlies and wolves should be displayed as incidentally present as dispersing individuals, but not believed to have established breeding populations at this time.

Comment Response 6: Letter 3

The information provided by the Army Corps of Engineers in Comment Letter 3 was incorporated into the Final EIS in Sections 3.4.2, 3.4.6.2, and 4.4.7.

Comment Response 7: Letters 5, 12, 17
Lewis' woodpecker nesting areas

The PSO Tract being evaluated in the exchange is the tract that P&M applied for, which represents all of the federal coal lands that P&M identified for acquisition. The actual tract that BLM would offer to exchange for the properties offered by P&M will depend upon the appraised value of the coal as compared to the appraised value of the P&M properties at the time the exchange is approved. According to 43 CFR 2200.0-6 (c), lands or interests to be exchanged shall be of equal value or equalized. The presence of potential nesting habitat for the Lewis' woodpecker in the scoria hillsides on the western edge of the PSO Tract is a factor for consideration in defining a final tract delineation for the PSO Tract that will satisfy the requirement that the values of the lands or interests are of equal value, if a decision to proceed with the exchange is made.

Comment Response 8: Letters 5, 17
Permitting stage evaluation of wetland and riparian areas

As discussed in Sections 3.4.8 and 4.4.7 of the Draft and Final EIS, SMCRA and Wyoming statutes require the replacement of all jurisdictional wetlands that are disturbed by surface coal mining. Replacement of non-jurisdictional wetlands is determined by the surface owner of the lands being mined. Jurisdictional wetlands are those wetlands that are under the regulatory authority of the EPA and the COE pursuant to Section 404 of the Clean Water Act.

In the case of the PSO Tract, the surface estate is both privately and federally owned. As shown in Figure 3-13 of the Final EIS (Figure 3-9 of the Draft EIS), approximately 6.41 acres of the surface of the PSO Tract is public land administered by the BLM. As the surface managing agency, BLM would evaluate restoration requirements of non-jurisdictional wetlands present on the public lands, if any, at the time a mining and reclamation plan is developed for the proposed Ash Creek Mine.

Since restoration of all jurisdictional wetlands is required by SMCRA and Wyoming statutes and regulations, it is considered part of the proposed action. Wetland restoration plans are developed during the mine permitting stage, when a detailed mining and reclamation plan that specifically identifies the

areas of wetland disturbance is evaluated. Wetland restoration plans for jurisdictional wetlands must be approved by COE prior to approval of the mining and reclamation plan. Approval of the mining and reclamation plan would be required prior to initiation of surface disturbance activities connected with removing the coal included in the PSO Tract.

Please refer to Comment Letter 3 for additional information on COE requirements related to wetlands during the mine permitting stage.

Comment Response 9: Letters 5, 12

a) Appendix E of the Final EIS includes updated lists of species provided by USFWS (see Comment Letter 17). The expected impacts to Threatened, Endangered, Proposed, Experimental, and Candidate Species on the Bridger lands, JO Ranch lands, Welch lands, and the PSO Tract are summarized in Table E-1.1 of Appendix E. No adverse effects to any T&E, Proposed, Experimental, or Candidate species are anticipated as a result of federal acquisition of the Bridger, JO Ranch, and Welch lands, any effects as a result of federal acquisition of those lands would be expected to be beneficial. Consultation with USFWS will be completed before the BLM State Director makes a decision to approve or disapprove this exchange.

b) Regarding the potential for coal extraction on the private coal lands adjacent to the PSO Tract, this coal could be mined with the coal included in the PSO Tract or with other coal (federal or non-federal) in this area, if the economic conditions make it profitable to do so. The private coal on the nearby lands is not owned by P&M and P&M does not have an agreement with the owner of those lands to mine the coal. P&M could pursue such an agreement if the exchange is completed and if they determine that the economic conditions warrant proceeding with their proposal to mine the coal in the PSO Tract. However, under those circumstances, the owner of that coal could also pursue other options for mining the coal. Since decertification of the Powder River Basin in 1989, BLM has not received any applications to lease federal coal in this area, the only mine in Sheridan County (the Big Horn Mine) has ceased operations, and one of the mines in Montana (the Decker Mine) recently experienced layoffs due to plans to reduce production.

c) BLM plans no water depletion projects from Cow Creek if it acquires the JO Ranch lands.

d) The Final EIS has been updated to reflect these comments.

Comment Response 10: Letters 6, 7, 8, 10, 16, 18, 19

Comment letters received from the Wyoming Office of Federal Land Policy, Wyoming Game and Fish Department, and Wyoming State Engineer's Office, USFS Lakewood, Colorado Office, WDEQ (cc of letter to EPA), EPA (cc of letter to WDEQ, dated 9/24/2002, and P&M were reviewed and the information provided was incorporated into the Final EIS where appropriate.

Comment Response 11: Letters 9, 13

a) Since decertification of the Powder River Federal Coal Region in 1989, the Wyoming BLM has received more than 20 applications to lease federal coal to existing mines in the eastern Powder River Basin (Campbell and Converse Counties, Wyoming). Twelve maintenance leases have been sold at competitive sales in response to those applications and eight additional applications are currently pending. At those sales in Campbell and Converse Counties, the Wyoming BLM has received bonus bids ranging from $0.11/ton to $0.70/ton. During that same time frame, the Wyoming BLM has not received any applications to lease federal coal in the western Powder River Basin (Sheridan County, Wyoming) and the only operating mine in the county (the Big Horn Mine) has closed. There has been one recent competitive sale of federal coal in the western portion of the basin, in Montana and the bonus bid for that sale was about $.0.11/ton. This sale, which was held in 2000, involved 150 acres of federal coal resources adjacent to the Spring Creek Mine, which is operated by the Spring Creek Coal Company, a subsidiary of Kennecott Energy. As discussed in the EIS, this mine is located approximately 7.5 miles north of the PSO Tract. It is true that the lack of an obligation to pay federal royalty or meet federal diligence requirements would reduce the costs of mining private coal, however, it is also true that BLM assigns a higher appraisal value to tracts like the Spring Creek Tract, which was leased to an existing mine as a maintenance lease, than it would assign to a tract like the PSO Tract, which would be leased for a new start mine. This is based on the guidance found in the "BLM Guide to Federal Coal Property Appraisal," and is due to consideration of the capital costs that a new mine must incur in order to begin mining and shipping coal.

b) If the BLM offered the PSO Tract for competitive sale and if a bid for the tract was received at that sale that met or exceeded the fair market value of the tract, as determined by BLM, the proceeds from that sale would go to the General Fund, not to BLM for use in purchasing the properties that P&M is offering to exchange. Any other use of those proceeds would require Congressional approval. Additionally, P&M has clearly stated that it is not offering and does not intend to sell its properties to BLM

and Forest Service. If the exchange is not approved, P&M would consider subdividing the properties and offering them for public sale in order to maximize their value. (See Comment Letter 19). Therefore, the alternative of offering the PSO Tract for competitive sale and using the proceeds to purchase P&M's property is not a reasonable alternative and BLM did not evaluate it in detail in the EIS.

Under Alternative 2 in the Final EIS, BLM and USFS evaluate the alternative of applying for Land and Water Conservation Fund monies to purchase the lands offered by P&M for exchange and conclude that it is not a reasonable alternative in this case. As stated previously, P&M has clearly stated that it is not offering and does not intend to sell its properties to BLM and Forest Service. Consequently, the land is not subject to Land and Water Conservation Fund acquisition, as it requires a willing seller. If the exchange is not approved, P&M would consider subdividing the properties and offering them for public sale in order to maximize their value. (See Comment Letter 19). Even if P&M was a willing seller, the process of obtaining funds from the Land and Water Conservation Fund requires two to three years, is a competitive process involving Congressional approval, must involve lands that are located within or adjacent to nationally/administratively designated areas, and the money appropriated would be equal to the appraised value of the lands. Assuming that, in two or three years, an appropriation was obtained for Land and Water Conservation Fund for the purpose of acquiring the portions of the lands that are eligible to receive the funding (the Bridger lands), and that some or all of the eligible lands were still available for sale at that time, it is not likely the U.S. could successfully compete against private entities in acquiring the Bridger lands. The JO Ranch lands and Welch lands could not be acquired under the Land and Water Conservation Fund, as they do not meet the criteria that the land be within or adjacent to a nationally/administratively designated area.

c) The requirement to make a public interest determination that will serve the public interest and "meet the needs of the State and local residents and their economies" (43 CFR 2200.0-6 (b) is a separate and distinct requirement from the requirement to complete an environmental analysis to evaluate the impacts of a proposed exchange (43 CFR 2200.0-6 (h). Prior to making a decision on whether to approve or disapprove this exchange, the BLM Wyoming State Director will make a determination that the exchange will or will not be in the public interest after considering the factors listed under 43 CFR 2200.0-6 (b), the analysis in this EIS, and the appraisals that are current at that time. After completion of the EIS but prior to making a public interest determination and issuing a notice of decision, the BLM will schedule and hold a public meeting to receive public comments on the public interest factors of the proposed exchange, as required under 43 CFR 2203.3. Completion of

these steps will meet the requirements under 43 CFR 2201.7 (a), which state "Upon completion of all environmental analysis and appropriate documentation, appraisals, and all other supporting studies and requirements to determine if a proposed exchange is in the public interest and in compliance with applicable law and regulations, the authorized officer shall decide whether to approve an exchange proposal."

As discussed in Chapter 1 of the EIS, the Resource Management Plans for the Bridger Teton National Forest, BLM Pinedale Field Office, BLM Rawlins Field Office and BLM Buffalo Field Office allow for the acquisition and disposal of land through exchange, and therefore the P&M Exchange proposal is in compliance with the applicable Resource Management Plans. The federal coal included in the PSO Tract has been found to be suitable for further consideration for leasing following application of the four coal screens; therefore, surface coal mining on these lands does not conflict with the BLM Buffalo Field Office Resource Management Plan.

The State of Wyoming has indicated that it supports the exchange due to the additional opportunities for recreational activities and improved management of wildlife populations (see Comment Letter 6). These opportunities will have residual socioeconomic impacts to the local economies. No residual socioeconomic impacts are anticipated once a mine is closed and reclaimed, if the exchange is completed and if P&M proceeds with its proposal to open a mine on the PSO Tract.

d) The EIS addresses the suitability of the PSO Tract for surface coal mining in Section 1.4 because P&M proposes to mine those lands if the exchange is completed. The suitability or unsuitability of the P&M-owned tracts (Bridger lands, Welch lands, and JO Ranch lands) for coal mining is not addressed in the EIS because there are no proposals to develop coal on these lands. If the exchange is completed and if BLM and/or Forest Service receives an application to lease any federal coal (acquired or existing) on these lands, the unsuitability criteria along with the other coal screens would have to be applied before a decision to lease the federal coal resource on these lands could be made. At this time, BLM and Forest Service do not consider the coal resources that the federal government would acquire if the exchange is completed to be either environmentally or economically viable for mining.

e) The EIS recognizes the loss of royalty for the coal in Section 4.4.19.

f) The EIS evaluates the impacts of mining the federal coal included in the PSO Tract on topography, physiography, geology, minerals, soils, air quality, surface and ground water resources, alluvial valley floors,

wetlands, vegetation, T&E species, wildlife, land use and recreation, cultural resources, Native American concerns, visual resources, noise, transportation facilities, socioeconomic, and hazardous and solid waste in Sections 4.4.1 through 4.4.20 of the Draft and Final EIS and Appendix E. The cumulative impacts to these resources are considered in Section 4.8. The impact analysis, which is based on the conceptual mine plan provided by P&M, is consistent with the analyses BLM has conducted and is conducting to evaluate maintenance lease applications and applications that could result in new mines (e.g., the West Rocky Butte lease application) in the eastern Powder River Basin since decertification. If the exchange is completed and if P&M proceeds with its proposal to mine the coal included in the PSO Tract, a detailed mining and reclamation plan must be reviewed and approved by WDEQ/LQD prior to initiation of coal mining operations on the tract.

g) The potential royalty revenues that would be due to the state and federal governments are also "tangential values" that would be realized by the state and federal governments if the coal in the PSO Tract is leased and mined. BLM has received no applications to lease federal coal in Sheridan County, Wyoming, since the Powder River Federal Coal Region was decertified in 1989, and there are no surface coal mines in operation in the county at this time.

h) The Draft EIS mistakenly indicates that the exchange is being processed under the 1988 Federal Land Transaction Facilitation Act (FLTFA). The FLTFA, or Public Law 106-248, became law in 2000. The Draft EIS should have indicated that the exchange is being processed under the Federal Land Exchange Facilitation Act (FLEFA) of 1988, and the Final EIS has been corrected to reflect this. None of the lands that the USFS or BLM would acquire if the exchange is completed meet the requirements of FLTFA because the lands that would be acquired are not in-holdings that lie within boundary of a federally designated area, as defined under FLTFA. Also, as stated previously, P&M has not offered and does not intend to sell its properties to BLM.

Comment Response 12: Letters 9, 13
Exchanges of Equal Value

In completing an exchange, the requirement to conduct an environmental analysis in accordance with NEPA [43 CFR 2200.0-6 (h)-*Environmental Analysis*] is a separate and distinct regulatory requirement from the requirement that the "lands or interests to be exchanged shall be of equal value or equalized…"[43 CFR 2200.0-6-*Equal Value Exchanges*]. Under 43 CFR 2201.7 (a), the regulations refer to completion of both the environmental analysis and the appraisals as "supporting studies and requirements to

determine if a proposed exchange is in the public interest and in compliance with applicable law and regulation." Accordingly, the analysis in this EIS is not intended to satisfy the requirements under 43 CFR 2200.0-6 (c). NEPA requires the preparation of an environmental analysis, in this case an EIS, which involves preparation of both a draft and final document and mandatory review and comment periods for both. As a result, it requires some time to complete an EIS. The appraised values of both the federal coal included in the PSO Tract and the land that P&M is offering have changed since the Agreement to Initiate an Exchange was signed and since the Draft EIS was released, and there will probably be additional changes before the NEPA process is completed. The NEPA analysis considers the exchange of all of the coal that P&M has identified for acquisition so that the EIS analysis of the environmental impacts of mining the coal includes the maximum amount of coal that the government is considering exchanging.

Prior to making a decision on whether or not to approve this exchange proposal, the authorized officer (the Wyoming State Director) will:

- make a determination as to whether the exchange lands are of equal or approximately equal value or can be equalized;
- schedule and hold a public meeting to receive public comments on the public interest factors of the proposed exchange;
- consider the analysis in this EIS; and
- make a determination that the exchange will or will not be in the public interest after considering the factors listed under 43 CFR 2200.0-6 (b)

The determination of whether or not the lands P&M has offered for exchange and the federal coal they want to acquire are of equal value or can be equalized in accordance with 43 CFR 2201.6 will be made using appraisals that are current at the time that the BLM considers approving the exchange. Appraisals that were conducted prior to that time are pre-decisional; they do not represent the values that will be used in determining if the exchange lands are of equal value.

The BLM will publish a notice of the decision to approve or disapprove the exchange as required under 43 CFR 2201.7-1(a) (1). That decision can be protested for a period of 45 days from the time the notice of the decision is published as required under 43 CFR 2201.7-1 (b).

Under 43 CFR 3480.0-5(a)(21), *maximum economic recovery* means that, "based on standard industry operating practices, all profitable portions of a leased federal coal deposit must be mined." The requirement does not apply to unleased federal coal deposits.

Comment Response 13: Letters 11, 13
Coal Conveyor Disturbance Area and Location

The 2,595 acres estimated disturbance area discussed on page 2-7 of the Draft EIS includes the estimated disturbance area for both the proposed coal conveyor and the rail loop and loadout facilities, based on the conceptual mine plan P&M provided for this analysis. The proposed conveyor location represents the most direct route between the proposed coal facilities on the PSO Tract and the proposed site of the unit train loadout facility on the BNSF mainline south of the PSO Tract. P&M selected the location of its proposed loadout facility to minimize disturbance and maximize use of existing facilities on the BNSF mainline. BLM is disclosing P&M's proposed conveyor location and proposed loadout facility location in this EIS. This disclosure does not grant approval of either the location or the construction of these facilities. BLM is not the agency that would authorize either the location or construction of these facilities. If the exchange is approved and if P&M proceeds with its proposal to open a surface coal mine, P&M would have to secure right-of-way agreements with Mr. Mommsen and any other surface land owners the conveyor would cross, as well as permits to construct the conveyor prior to initiating construction activities. The location of the facilities could change based on a number of factors, including costs, rights-of-way, and requirements imposed by construction permits. The Final EIS includes an additional explanation of the conceptual nature of the mining plan used in preparing the EIS analysis, describes the kinds of approvals that would be needed prior to construction of a conveyor, and recognizes the potential adverse impacts that would occur to a dwelling located in the NW/4 NW/4 Section 33, T.58N., R.84W. if the conveyor is actually approved and constructed in the location shown in the EIS.

Comment Response 14: Letters 11, 13

a) The Final EIS has been corrected to reflect that the Ash Creek Road is not a public road.

b) Section 3.4.5 of the Final EIS describes both voluntary measures that some of the mines have instituted and measures required by WDEQ at some existing mines related to NO_X, including direct notification of neighbors and workers prior to blasting. The specific measures that WDEQ might require would be determined during the mining and reclamation permit approval process for the Ash Creek Mine, if the exchange is completed and if P&M proceeds with the proposal to mine the coal in the PSO Tracts. Other mechanisms that can be requested during the permitting process to protect adjacent landowners from impacts related to blasting include a pre-mining blasting survey to establish pre-mining conditions of water wells and structures that could

be affected by blasting activities and a hearing before the Environmental Quality Council.

c) The estimated PM_{10} level of 16.7 µg/m^3 (Figure 4-1) and the estimated NO_X level of 24 µg/m^3 (Figure 4-2) are both below federal standards, which are shown in Table 3-4 of the Final EIS. As indicated in the first paragraph of Appendix F of the Draft EIS (page F-1), one part per million (ppm) of NO_2 in air equals 1,880 µg/m^3. The EPA Significant Harm Level for NO_2 (1-hour average) of 2 ppm equals 3,760 µg/m^3 and the NIOSH Immediately Dangerous to Life & Health Level for NO_2 of 20 ppm equals 37,600 µg/m^3 (see page F-3 of the Draft EIS).

d) The groundwater right located in Section 33, T.58N., R.84W. is included on Page E-6 of Appendix E (Appendix G of the Final EIS) in the Draft EIS. Figure 4-3 of the Draft and Final EIS shows expected groundwater drawdown impacts from the proposed Ash Creek Mine. No impacts to groundwater are expected to wells located in Section 33, T.58N., R.84W. because the coal beds and overlying sediments that would be removed if the PSO Tract is mined are not continuous with (i.e., connected to) the coal beds and overlying sediments in Section 33. The coal beds and overlying sediments that would be removed from the PSO Tract are truncated by erosion and faulting, as shown in Figure 4-3. The erosional outcrop and faults act to isolate the coal and overlying aquifers in the block of coal that would be mined in the PSO Tract from the coal and overlying aquifers to the northwest, southwest, and southeast of the PSO Tract. Therefore, groundwater drawdowns in the coal and overlying aquifers that are projected to occur if the PSO Tract is mined would occur to the northeast, as depicted on Figure 4-3.

Comment Response 15: Letters 12, 13

a) The Final EIS incorporates the results of the regional air quality technical report prepared by Argonne Laboratories for the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* and the Montana *Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans*.

b) The Final EIS discloses both the voluntary measures that mines have initiated and the required precautions that WDEQ has put in place to protect the public from the potential health impacts of blasting in Section 3.4.5.6. The suggested measures included in the EPA comment letter are in place as required precautions and are being applied to mitigate the impacts of blasting releases. As discussed in Section 4.8.4.4 of the Final EIS, while OSM received citizen complaints concerning NO_x gases generated from blasting operations drifting off mine permit areas in

1995, 1998, and 1999, no citizen complaints were received by OSM or WDEQ during the 2001 evaluation year, which ended on September 30, 2001, or the 2002 evaluation year, which ended on September 30, 2002.

The Final EIS does include a discussion of public health exposure limits for NO_2 in Section 4.4.4.

As discussed in Comment Letter 16, the risk posed by NO_2 from blasting is very specific to the type of operation and to the location, and the measures that should be taken should therefore be very specific to the type of operation and the location.

c) The Crow Tribe is currently negotiating with the Bill Barrett Corporation regarding termination of their agreement to develop CBM on the eastern portion of the Crow lands. There are currently no existing coal leases or proposals to lease coal in the Youngs Creek Area. Montana BLM has processed one lease by application for a maintenance lease in the area since decertification of the Powder River Federal Coal Region (Spring Creek Mine), while Wyoming BLM has not received any applications to lease coal in Sheridan County and the one existing surface coal mine in this county (the Big Horn Mine) has closed down since decertification. Market demand for coal from this area, which was used to estimate coal production levels in the air quality impact analysis, is currently being met by existing coal mines and is projected to remain relatively stable from now through 2020. Development of new coal mines might become more economically feasible if production at the existing coal mines in this area declines and if the demand for the coal from this area remains stable, as is currently projected.

Comment Response 16: Letter 13

a) BLM determines what information is or is not included in the environmental analysis, whether it is prepared by a third-party contractor or by BLM. In the case of coal development in the Powder River Basin, BLM bases its data requirements on the Data Adequacy Standards for the Powder River Federal Coal Region. The surveys and monitoring data that are used in evaluating the impacts in the coal leasing EISs are generally used for both leasing and permitting purposes and the data are collected in accordance with the requirements of both the leasing and permitting agencies.

BLM provides the third party contractor with a preparation plan that identifies the information that needs to be included in the EIS. The preliminary document that BLM receives from the third party contractor is reviewed by cooperating agencies and BLM specialists and information

is added, updated, and corrected in response to the comments that are received from these agencies and specialists. BLM is responsible for the final content of the document that is released to the public. BLM's intent in editing these documents is to present the data objectively and allow the reader to determine the significance of the impacts and whether they are adverse or beneficial. When information is received that data are out of date or have been omitted or are incorrect, the EIS is changed to reflect this.

b) The EIS identifies the air quality, ground water, surface water, wildlife, noise, and transportation impacts that would be expected if the PSO Tract is mined, and addresses the proposed conveyor (see Comment Response 13). The EIS also identifies many of the regulatory compliance, mitigation and monitoring measures that would be required if the exchange is completed and if P&M proceeds with its plan to mine the coal in the PSO Tract. These measures, which include a requirement to replace existing water rights that are interrupted, discontinued, or diminished and the right of property owners to request a pre-blasting survey to document the condition of water wells and structures prior to mining, would be developed at the time a mining and reclamation permit is evaluated by WDEQ.

c) Executive summaries of the cultural resources present on the P&M tract have been sent to all tribes known to have an interest in the region, including the Crow and the Northern Cheyenne. The Crow have expressed an interest in visiting the area. A tour was set to occur last summer, but did not take place due to changes in the Crow Tribal Administration. BLM will work with all interested tribes to provide tours of the area and specific resources.

d) The regulations governing air emissions are complicated, but the information presented in the Draft EIS does reflect the regulations on potential emissions.

- Under PSD regulations, a surface coal mine, new or existing, is not a major source unless the PTE is equal to or exceeds 250 tons per year, as stated on page 3-24 of the Draft EIS.

- On page 4-11, the Draft EIS discusses the PSD regulations, and states "Specific types of facilities which emit, or have the PTE, 100 tpy or more of PM_{10} or other criteria air pollutants, or any facility which emits, or has the PTE, 250 tpy of (sic-should be or) more of PM_{10} or other criteria air pollutants, is considered a major stationary source. However, fugitive emissions are not counted against the PSD threshold unless the source is so designated by federal rule (40 CFR 52.2)." A surface coal mine is not one of the

"specific types" of facilities that would be considered a major stationary source with an emission of 100 tpy of PM_{10}.

- The discussion on page 4-12 of the Draft EIS addresses the Federal Operating Permit, or Title V Program, which is different from the PSD regulations. The Title V Program requires that a facility that has a PTE of more than 100 tpy of any regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy or more of any combination of HAPs, from applicable sources to submit a Title V Permit.

According to WDEQ/AQD (Mike Warren), all new mines would need a New Source Review Permit, a Title V Operation Permit if emissions of any regulated pollutant would exceed 100 tpy, and a PSD permit if emission of PM_{10} or other criteria air pollutants would exceed 250 tpy. Currently, one of the existing mines in the Powder River Basin has a Title V permit and none of the existing mines in the Powder River Basin is a major source under PSD regulations.

e) The referenced discussion in the Draft EIS discusses the anticipated impacts to West Branch and Little Youngs Creek and wetlands in terms of mining disturbance of those drainages. Ash Creek is not included in that discussion because it would not be directly disturbed by mining. Surface water impacts to Ash Creek and to other creeks and wetlands in the area are addressed in the discussions in Sections 4.4.1, 4.4.5, and 4.8.5, which indicate that West Branch, Little Youngs Creek, and Youngs Creek would be diverted or blocked to prevent flooding if necessary, that changes in runoff characteristics and sediment discharges would occur during mining, that changes in drainage patterns and surface disturbance would decrease flows in most of the ephemeral and intermittent drainages exiting the mines sites, and that both state and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards before it is allowed to flow off the mine permit areas.

f) The EIS identifies the impacts to wildlife related to energy development in the Powder River Basin, wildlife mitigation measures related to surface coal mining operations in Section 4.4.10 and in Table 4-8. The mitigation measures are in place for existing mines in the Powder River Basin and would be required if the exchange is completed and if P&M proceeds with its proposal to mine the PSO Tract. The Draft EIS (Sections 4.4.10 and 4.8.9) also point out that the WGFD has recommended that big game monitoring be discontinued on all existing mine sites in Wyoming due to the fact that monitoring has demonstrated a lack of impacts to big game on the existing mine sites in the eastern Powder River Basin.

g) The Final EIS references the results of the air quality impact analysis prepared by Argonne National Laboratories and presented in the Wyoming *Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (Wyoming Final Oil and Gas Project EIS) and the Montana *Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans* (Montana Statewide Oil and Gas EIS). In preparing these Final EISs, the BLM worked cooperatively with the EPA and the Wyoming and Montana Departments of Environmental Quality to improve the air quality analysis. Please refer to the Comment Responses in the Wyoming Final Oil and Gas Project EIS and the Montana Final Statewide Oil and Gas EIS for responses to comments received on the draft air quality impact analysis prepared by Argonne National Laboratories.

The proposed Ash Creek Mine would be located on the western edge of the area of analysis for CBM development in Wyoming. The air quality impact analysis incorporated the estimated potential emissions at active mines within the modeling domain for 2006, which was the projected peak emission year for the Montana and Wyoming CBM development. Coal production rates were estimated based on market demand for the coal for that year. Since the air quality impact analysis considers potential impacts during the projected peak emission year, and since market demand for coal from this part of the Powder River Basin is projected to remain fairly level with or without development of the Ash Creek Mine, cumulative impacts to air quality if the Ash Creek Mine is developed are not predicted to exceed cumulative air quality impacts estimated by the final Argonne air quality impact analysis.

h) The Draft and Final EIS address cumulative impacts to ground water in Section 4.8.5. As shown in Figure 4-3, the mineable coal beds in the PSO Tract are truncated by northeast trending faults on the northwestern and southeastern edges of the area to be mined and by the outcrop of the coal beds to be mined on the southwest side of the proposed Ash Creek Mine area. As a result, no cumulative impacts to groundwater are projected to the northwest, southwest, or south. Therefore, as discussed in the Draft and Final EIS, cumulative effects would occur primarily as a result of other activities that are occurring to the northeast in the same fault block as the PSO Tract, which would include CBM development and the Decker Mine. Projected drawdowns from mining operations at the Decker Mine do not extend into the PSO Tract area. CBM production in the same fault block is projected to extend into the PSO Tract. Two groundwater rights holders in Montana have been identified as potentially affected by the proposed mining operations on the PSO Tract. Mitigation is addressed in Table 4-8, and includes required replacement of existing water rights that are

interrupted, discontinued, or diminished by mining with water of equivalent quality.

i) The referenced statement in the Draft EIS was not intended as a commentary on the uniqueness of the visual resources of this area, it was intended to disclose that no visual resources have been identified on the PSO Tract that are uniquely different from the visual resources in the area surrounding the tract. The Final EIS has been revised to state this more clearly.

Comment Response 17: Letter 15

If the exchange is completed as proposed, the BLM and USFS would acquire the lands in the Bridger Lands, JO Ranch Lands, and Welch lands, which are currently privately owned. If these lands become public lands, no federal actions that would threaten any treaty rights or any sites are proposed, but tribes with an interest in these lands would be consulted if any federal actions that might affect treaty rights are proposed on these lands in the future.

For the PSO Tract in Sheridan County, Wyoming, exchange of the coal could lead to disturbance of the tract. An executive summary of the cultural resources identified on the PSO Tract has been sent to tribes identified as having an interest in the Powder River Basin. If the Shoshone-Bannock Tribes have an aboriginal interest in this area and wish to receive the summary of the cultural resources, please advise us to that effect. BLM will work with interested tribes to provide tours of the area and specific resources.

Comment Response 18: Letters 20, 21

Mr. John Willson, in a May 1, 2003 letter and a May 9, 2003 letter, commented on the Draft EIS. Mr. Willson pointed out that the land ownership shown on Figure 3-9 in the Draft EIS was incorrect. The Final EIS has been changed to reflect the ownership of the surface estate as discussed in Mr. Willson's comments.

P&M's exchange proposal is to exchange lands that they own for federal coal underlying the PSO Tract, which is described in Section 2.1 of the Final EIS. The PSO Tract includes federal coal underlying the surface land that P&M owns as well as coal underlying surface land that Mr. Willson and several other private entities own. In addition, the P&M exchange proposal includes federal coal underlying 6.41 acres of public land administered by BLM. Land ownership in the PSO Tract is described in Section 3.4.11 and shown in Figure 3-13 of the Final EIS. Mr. Willson indicates that he doesn't object to P&M acquiring coal under their surface, but he does object to P&M acquiring coal

under his surface. Mr. Willson's solution is to exchange private land (approximately 276.78 acres) that he owns adjacent to the Welch Ranch to BLM for the coal under his private surface (approximately 117.67 acres) in the proposed coal exchange tract (PSO Tract).

The exchange proposal in Mr. Willson's May 1, 2003 comment letter represents a separate conflicting exchange proposal with P&M's exchange proposal. The same coal or portions of the same coal would be exchanged under both the P&M proposal outlined in the Final EIS and under the new proposal made by Mr. Willson in his May 1 and May 9, 2003 letters. Mr. Willson is correct, in his May 9, 2003 letter, when he concludes that it has not been determined that the land P&M has offered is of sufficient value to obtain all of the coal in the designated area. As discussed in Comment Response 12, after completion of the Final EIS and prior to making a decision on whether or not to approve this exchange proposal, the authorized officer (the Wyoming State Director) will make a determination as to whether the exchange lands are of equal or approximately equal value or can be equalized. That determination will be publicly available. If the value of the lands that P&M is offering is not of sufficient value to obtain all of the coal in the PSO Tract, the regulations provide for modifying the exchange proposal by excluding lands and/or by the use of a cash equalization payment (43 CFR 2201.6). If the value of the federal coal in the PSO Tract is determined to be greater than the value of the lands P&M is offering for exchange, BLM will evaluate options for modifying the PSO Tract to equalize the values.

While the private lands BLM would acquire under the Willson proposal are adjacent to the Welch Ranch, they are much smaller parcels. Future acquisition of these smaller parcels may be in the public interest if the P&M exchange proposal outlined in the Final EIS is completed.

The BLM, the USFS, and P&M began exchange negotiations in 1998, and the current exchange proposal addressed in the Final EIS was developed based on those negotiations, on public scoping meetings and comments, and on potential public interest considerations associated with P&M's exchange proposal. BLM segregated the public lands proposed for transfer to P&M from all forms of appropriation (including new land exchange proposals) under the public land laws in a December 21, 2000 Notice of Exchange Proposal. Changing any of the existing exchange parameters by introducing a new conflicting exchange proposal at this point may jeopardize the exchange participants' ability to make a public interest determination and to complete the exchange. For these reasons, Mr. Willson's exchange proposal must be considered as a separate exchange proposal that cannot be incorporated into P&M's exchange proposal.