# 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 σg/m³) | 120 ppbv (235 σg/m³) | Same as Primary Standards |
| | 8-Hour[b] | 80 ppbv[c] (157 σg/m³) | 80 ppbv (157 σg/m³) | ---- |
| Carbon Monoxide (CO) | 8-Hour[d] | 9 ppmv (10 mg/m³) | 9 ppmv (10 mg/m³) | ---- |
| | 1-Hour[e] | 35 ppmv (40 mg/m³) | 35 ppmv (40 mg/m³) | ---- |
| Oxides of Nitrogen ($NO_x$) as Nitrogen Dioxide ($NO_2$) | Annual | 100 σg/m³ (50 ppbv) | 100 σg/m³ (53 ppbv) | Same as Primary Standards |
| Sulfur Dioxide ($SO_2$) | Annual | 60 σg/m³ (20 ppbv) | 80 σg/m³ (30 ppbv) | ---- |
| | 24-Hour[d] | 260 σg/m³ (100 ppbv) | 365 σg/m³ (140 ppbv) | ---- |
| | 3-Hour[d] | 1,300 σg/m³ (500 ppbv) | ---- | 1,300 σg/m³ (500 ppbv) |
| Particulate Matter Ω10 Microns in Aerodynamic Diameter ($PM_{10}$) | 24-Hour[d] | 150 σg/m³ | 150 σg/m³ | Same as Primary Standards |
| | 24-Hour (Based on the 99th Percentile Averaged over Three Years) | ---- | 150 σg/m³ | ---- |
| | Annual Arithmetic Mean | 50 σg/m³ | 50 σg/m³ | Same as Primary Standards |
| Particulate Matter Ω2.5 Microns in Aerodynamic Diameter ($PM_{2.5}$) | 24-Hour (Based on the 98th Percentile Averaged over Three Years) | 65 σg/m³ | 65 σg/m³ | ---- |
| | Annual Arithmetic Mean Averaged over Three Years | 15 σg/m³ | 15 σg/m³ | ---- |
| Lead (Pb) | Calendar Quarter | 1.5 σg/m³ | 1.5 σg/m³ | Same as Primary Standards |
| Hydrogen Sulfide | ½ Hour | Primary 70 σg/m³[e] | ---- | ---- |
| | ½ Hour | Secondary 40 σg/m³[f] | ---- | ---- |
| Suspended Sulfates | Annual | 250 σg/m³ | ---- | ---- |
| | 30 Day | 500 σg/m³ | ---- | ---- |
| Fluorides in Ambient Air | 12 Hours | 3 σg/m³ | ---- | ---- |
| | 24 Hours | 1.8 σg/m³ | ---- | ---- |
| | 7 Days | 0.5 σg/m³ | ---- | ---- |
| | 30 Days | 0.4 σg/m³ | ---- | ---- |

[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 $\sigma g/m^3$ (annual geometric mean) and 8 $\sigma g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities which emit, or have the PTE, 100 tpy or more of $PM_{10}$ or other criteria air pollutants, or any facility which emits, or has the PTE, 250 tpy 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 σg/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 σg/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; establish-ment 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 $\sigma g/m^3$ 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 $\sigma g/m^3$) 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 $\sigma g/m^3$ (annual $PM_{10}$) and 0.15 $\sigma g/m^3$ (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 $\sigma g/m^3$. This is below the "significant impact level" of 1.0 $\sigma g/m^3$ that would be deemed to

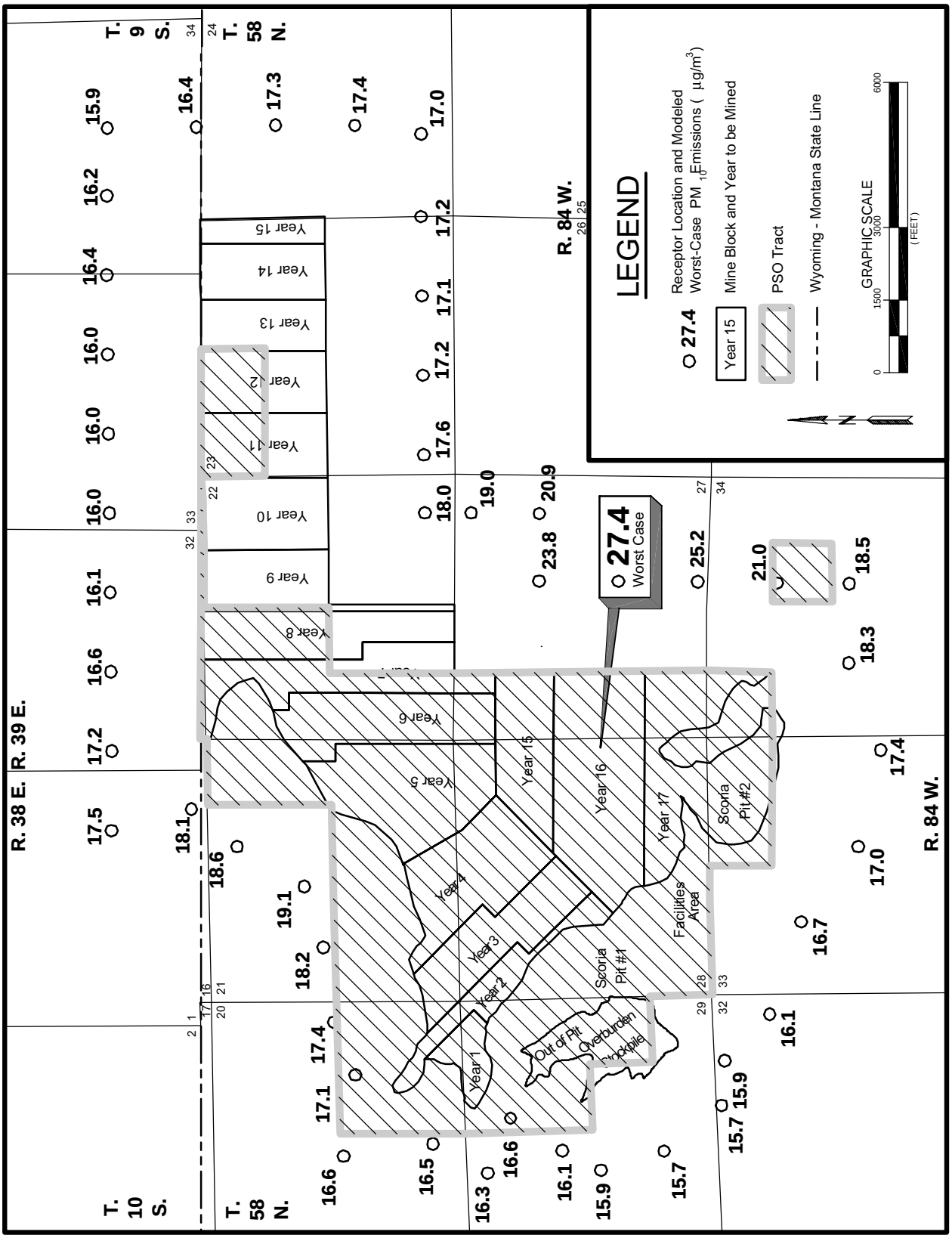


Figure 4-1. Modeled Maximum $PM_{10}$ Annual Average Concentrations ($\mu g/m^3$), Including Background of 15 $\mu g/m^3$, at the Proposed Ash Creek Mine.

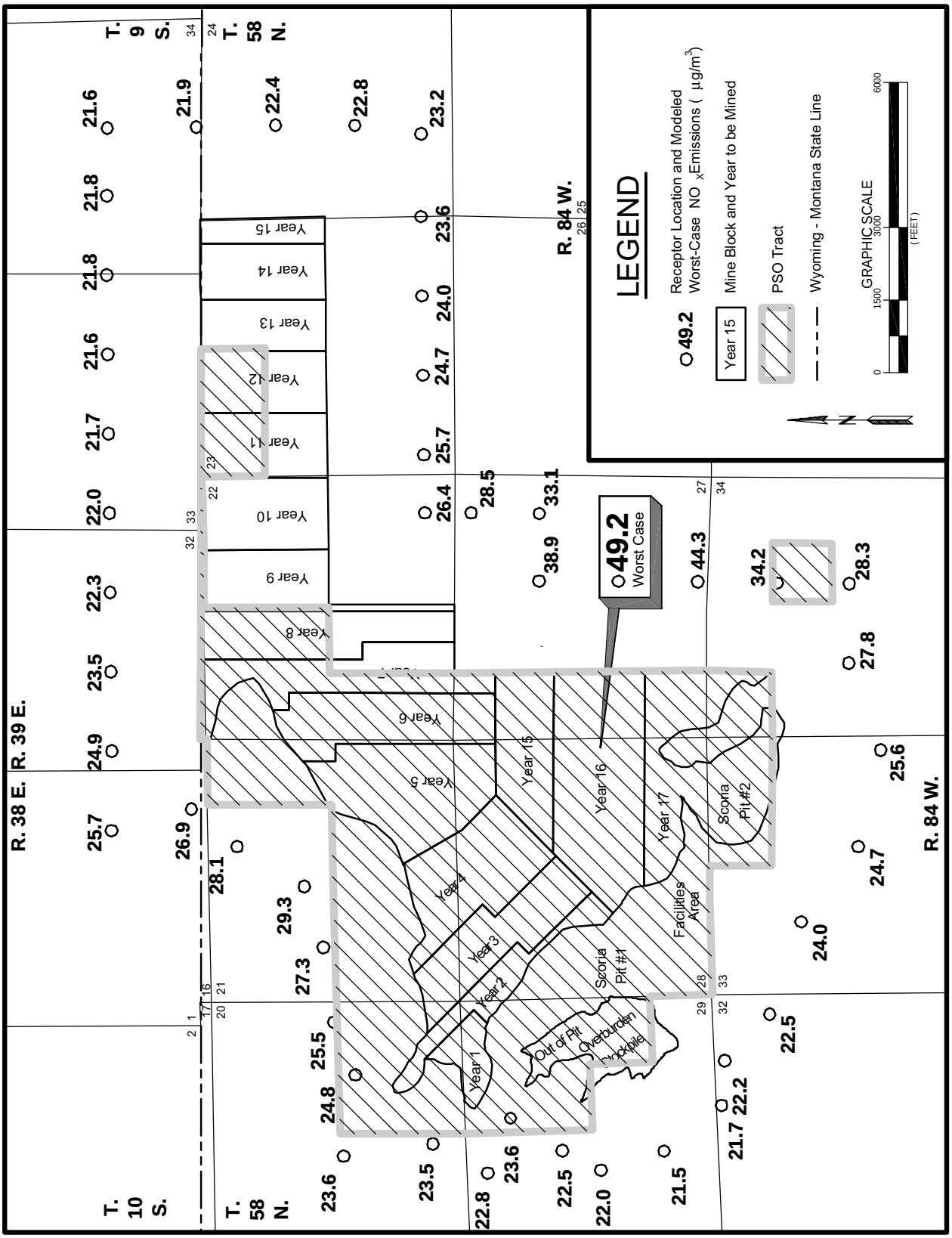


Figure 4-2. Modeled Maximum $NO_X$ Annual Average Concentrations (µg/m$^3$), Including Background of 20 µg/m$^3$, at the Proposed Ash Creek Mine.

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

| | $PM_{10}$ ($\sigma g/m^3$) | $NO_x$ ($\sigma g/m^3$) |
|---|---|---|
| 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

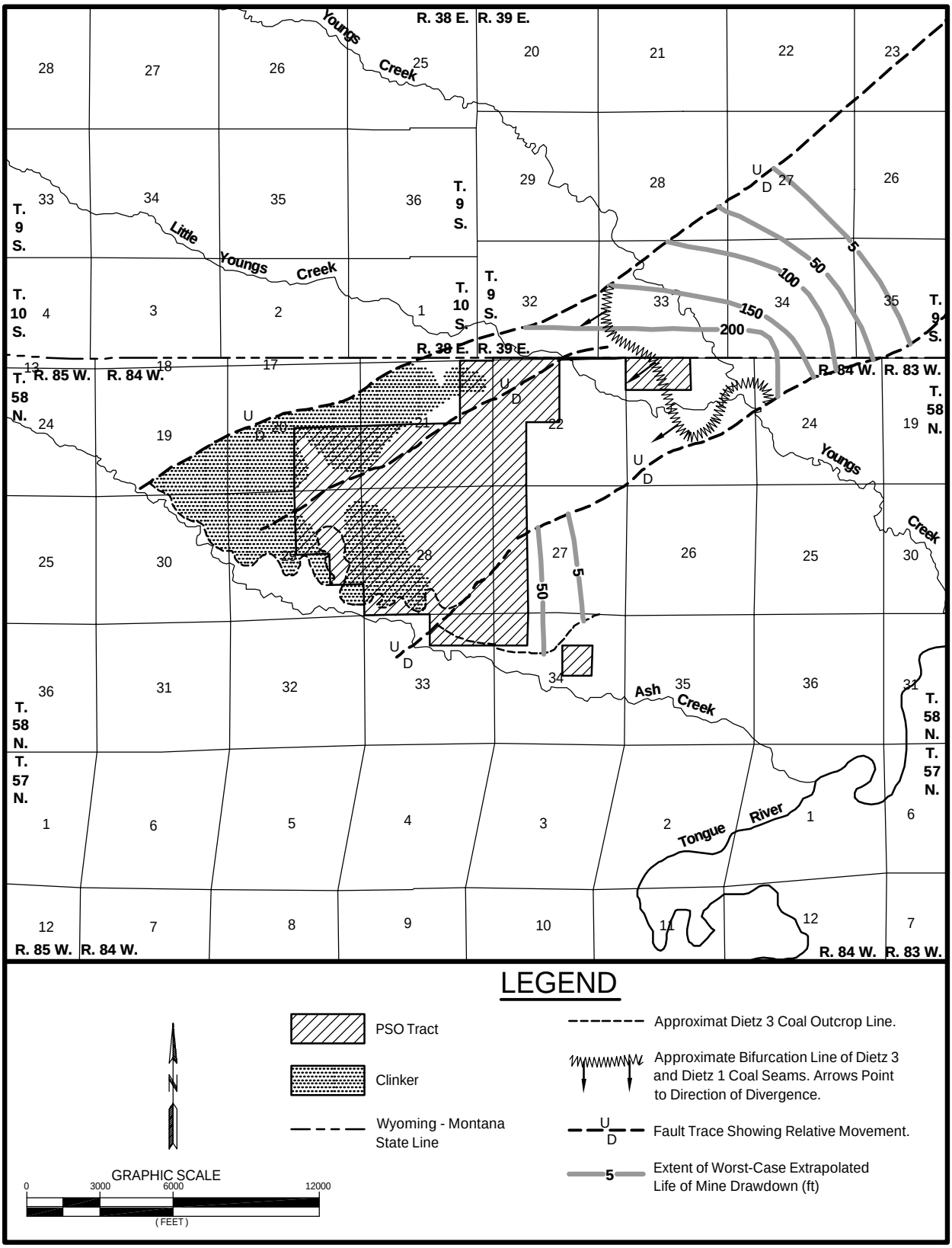


Figure 4-3. Life of Mine Drawdown Map, Resulting from Proposed Action.

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;<br>Protecting soil stockpiles from disturbance and erosional influences;<br>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;<br>Using particulate pollution control technologies;<br>Using work practices designed to minimize fugitive particulate emissions;<br>Using EPA- or state-mandated BACT, including:<br>Fabric filtration or wet scrubbing of coal storage silo and conveyor vents,<br>Watering or using chemical dust suppression on haul roads and exposed soils,<br>Containment of truck dumps and primary crushers,<br>Covering of conveyors,<br>Prompt revegetation of exposed soils,<br>High efficiency baghouses on the crusher, conveyor transfer, storage bin and train loadout, meeting a standard of 0.01 grains per dry standard cubic foot (dscf) of exit volume,<br>Watering of active work areas,<br>Reclamation plan to minimize surface disturbances subject to wind erosion,<br>Paving of access roads. | On-site air quality monitoring for $PM_{10}$ or TSP;<br>Off-site ambient monitoring for $PM_{10}$ or TSP;<br>On-site compliance inspections. |
| Surface Water | Building and maintaining sediment control ponds or other devices during mining;<br>Restoring approximate original drainage patterns during reclamation;<br>Restoring stock ponds and playas during reclamation. | Monitoring storage capacity in sediment ponds; monitoring quality of discharges; monitoring 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;<br>Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity. | Monitoring wells track water levels in overburden, coal, interburden, underburden, & backfill. |
| Groundwater Quality | Evaluating cumulative impacts to water quality associated with proposed mining;<br>Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality. | Monitoring wells track water quality in overburden, coal, interburden, underburden, & backfill. |
| Alluvial Valley Floors | Identifying all AVFs that would be affected by mining;<br>Determining significance to agriculture of all identified AVFs affected by mining (WDEQ);<br>Protecting downstream AVFs during mining;<br>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;<br>Identifying jurisdictional wetlands (COE);<br>Replacing all jurisdictional wetlands that would be disturbed by mining;<br>Replacing functional wetlands as required by surface managing agency or surface land owner. | Monitoring of reclaimed wetlands using same procedures used to identify pre-mining jurisdictional wetlands. |
| Vegetation | Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area;<br>Reclaiming 20 percent of reclaimed area with native shrubs at a density of one per square meter;<br>Controlling erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures;<br>Chemically and mechanically controlling weed infestation;<br>Direct hauling of topsoil;<br>Selectively planting shrubs in riparian areas;<br>Planting sagebrush;<br>Creating depressions and rock piles;<br>Using special planting procedures around rock piles;<br>Posting reclamation bond covering the cost of reclamation. | Monitoring of revegetation growth & diversity until release of final reclamation bond (minimum 10 years). Monitoring of erosion to determine need for corrective action during establishment of vegetation. Use of controlled grazing during revegetation evaluation to determine suitability for post-mining land uses. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action) (Continued).

| Resource | Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1] | Monitoring[1] |
|---|---|---|
| Wildlife | Restoring pre-mining topography to the maximum extent possible;<br>Planting a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife;<br>Designing fences to permit wildlife passage;<br>Raptor-proofing power transmission poles;<br>Creating artificial raptor nest sites;<br>Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land;<br>Cottonwood plantings along reclaimed drainages;<br>Replacing drainages, wetlands, and AVFs disturbed by mining;<br>Reducing vehicle speed limits to minimize mortality;<br>Instructing employees not to harass or disturb wildlife;<br>Preparing raptor mitigation plans. | Baseline & annual wildlife monitoring surveys;<br>Monitoring for Migratory Bird Species of Management Concern in Wyoming. |
| Threatened, Endangered, Proposed, and Candidate Species | Avoiding bald eagle disturbance;<br>Restoring bald eagle foraging areas disturbed by mining;<br>Restoring mountain plover habitat disturbed by mining;<br>Using raptor safe power lines;<br>Surveying for Ute ladies' tresses;<br>Surveying for mountain plover;<br>Searching for black-footed ferrets if prairie dogs move onto tract;<br>Surveying for black-tailed prairie dog;<br>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;<br>Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP;<br>Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan;<br>Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations;<br>Instructing employees of the importance of and regulatory obligations to protect cultural resources. | Monitoring of mining activities during topsoil stripping; cessation of activities and notification of authorities if unidentified sites are encountered during topsoil removal. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

Table 4-8. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Required by SMCRA and State Law (included in the Proposed Action) (Continued).

| Resource | Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1] | Monitoring[1] |
|---|---|---|
| Native American Concerns | Notifying Native American tribes with known interest in this area of leasing action and request for help in identifying potentially significant religious or cultural sites. | No specific monitoring program. |
| Paleontological Resources | Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining. | No specific monitoring program. |
| Visual Resources | Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species. | No specific monitoring program. |
| Noise | Protecting employees from hearing loss. | MSHA inspections. |
| Transportation Facilities | Relocating existing pipelines, if necessary, in accordance with specific agreement between pipeline owner and coal lessee. | No specific monitoring program. |
| Socioeconomics | Paying royalty and taxes as required by federal, state, and local regulations. | Surveying and reporting to document volume of coal removed. |
| Hazardous & Solid Waste | Disposing of solid waste and sewage within permit boundaries according to approved plans;<br>Storing and recycling waste oil;<br>Maintaining of files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining;<br>Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable existing or hereafter promulgated federal, state, and government requirements;<br>Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended;<br>Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended;<br>Preparing emergency response plans. | No specific monitoring other than required by these other regulations and response plans. |

[1] If a decision is made to complete the exchange and P&M decides to construct a new mine, these requirements, mitigation plans, and monitoring plans would be part of a mine permit application covering the PSO Tract that must be approved before mining can occur on the tract under the Proposed Action.

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] | Coal Production[1] 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 $\sigma g/m^3$, 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 (σg/m³) | Non-Project (σg/m³)[1] | Cumulative (σg/m³) | PSD Class II (σg/m³) | Background (σg/m³) | Total (σg/m³)[2] | WAAQS (σg/m³) | NAAQS (σg/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 $\sigma g/m^3$) 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 σeq/L; and no more than a 1.0 σeq/L change for those extremely sensitive water bodies where the existing ANC is below 25 σeq/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 (σeq/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 σeq/L, the potential ANC change is expressed in σeq/L, and the applicable threshold is 1.0 σeq/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 $\sigma g/m^3$ $PM_{10}$ 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.