CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The potential environmental consequences of the proposed lease exchange and subsequent mining are discussed for each affected resource under each alternative. An environmental consequence or impact is defined as a modification in the existing environment brought about by development activities. Impacts can be beneficial or adverse, can be a primary result of an action (direct) or a secondary result (indirect), and can be permanent or long-lasting (long term) or temporary and of short duration (short term). Impacts can vary in degree from a slightly discernable change to a total change in the environment.

Short-term impacts occur during and immediately after mining activities are completed. Although short in duration, such impacts may be obvious and disruptive. For this project, short-term impacts are defined as those lasting five years or less, whereas long-term impacts last more than five years.

Potential impacts from this project were classified at one of four levels: significant, moderate, negligible, and no impact. Significant impacts (as defined in 40 CFR 1500-1508) are effects that are most substantial and should receive the greatest attention in decision-making. In addition, a finding of significant impacts requires preparation of an environmental impact statement. Moderate impacts do not meet the criteria to be classified as significant but do result in change that is easy to detect. Negligible impacts result in little or no effect to the existing environment and cannot be easily detected. In the following discussions, impacts are considered adverse unless identified as beneficial.

Residual impacts, cumulative impacts, irreversible and irretrievable commitment of resources, and short-term use of the environment versus long-term productivity are discussed in a separate section. Residual impacts are those that might remain in spite of mitigation measures. Irreversible and irretrievable impacts are permanent reductions or losses of resources that cannot be regained. In comparing short-term use of the environment versus long-term productivity, short-term use of the environment is that use during the life of the project. Long-term productivity refers to the period after the project is completed and the area reclaimed. Cumulative impacts are those which result from the incremental impacts of an action added to other past, present, and reasonably foreseeable actions, regardless of who is responsible for such actions.

IMPACTS OF THE PROPOSED ACTION

Topography and Geology

Topography/Physiography

Assuming the lease is issued and assigned to Triton, as part of the permit to mine, WDEQ would require a detailed mine plan revision that would include a plan for surface water diversions and maintenance of surface runoff patterns if the proposed lease exchange is completed as proposed. WDEQ would also require detailed plans for postmining topography which must be designed to support WDEQ-approved postmining land uses. The effects on topography would be widespread, long-term, and permanent under the Proposed Action. Direct impacts to topography from mining would include short- and long-term disruption of the landscape from pit excavations and the development of a 175- to 200-foot highwall and 100-foot high spoil piles. Minor surface alterations would occur from road and other facilities construction. Drainage patterns would be altered in the mine vicinity; however, all local surface runoff would be diverted around the mine and back into natural channels. Thus, regional drainage patterns would not be affected. Direct topographic impacts from erosion and gully formation most likely would not occur because erosion control measures would be implemented throughout the life of the mine. Under the Proposed Action, 840 acres would be impacted in addition to the area that would be disturbed as a result of already permitted coal removal at the Buckskin Mine.

After reclamation, topography would be similar to premine topography except that the overall landscape would be flatter and approximately 77.5 feet lower because coal has been removed. Replaced spoil typically occupies more space than the original overburden, and this would offset lowering of the landscape from coal removal. Some of the prominent ridges and rock outcrops in the area would be removed during mining and replaced with rolling hills. Constructing facilities, and cutting and filling to make roadways would affect topography as would ditches and culverts created for drainage. Power line impacts on topography would essentially be unnoticeable. Lowering the landscape due to coal removal and cutting and filling for roads and facilities would have only moderate impacts on the human environment because the postmining landscape would be regraded to blend with the surrounding topography and would support proposed postmining land uses.

Geology and Minerals

The lease exchange and subsequent mining would result in removing and eventually burning approximately 101 million tons of surface-recoverable coal. These impacts would be beneficial because the purpose of the exchange is to make coal available for mining.

An average of 100 feet of overburden plus 90 feet of coal would be removed during mining, and approximately 98,252,000 cubic yards of overburden would be removed and replaced. This overburden material would be converted from solid stratified to broken rock to a maximum depth of 240 feet over about 599 acres in the proposed lease exchange area. The replaced overburden would be a relatively similar mixture averaging approximately 112.5 feet thick (assuming that overburden volume would initially increase approximately 25% followed by compaction to 90% of the increased volume). This increase minus the coal would result in an average overall reduction of approximately 77.5 feet in surface elevations in the proposed lease exchange area. Surface and subsurface geology would be permanently altered by mining, but once reclaimed the geologic effects would be unnoticeable except to future developers of other minerals.

Some strata in the Hay Creek tract are likely to contain unsuitably high or low concentrations of one or more of the other monitored parameters (boron, pH, etc.). These unsuitable parameters could affect revegetation potential and groundwater quality in the postmining aquifer. As part of the mine permit application, detailed overburden sampling would be conducted to identify the location and extent of unsuitable materials. Study results would be used to develop an overburden handling plan that would include provisions for burying unsuitable overburden away from the root zone and above the expected water table or mixing strata with unsuitable characteristics with suitable strata to dilute concentrations to suitable levels. Therefore, impacts resulting from unsuitable overburden would be negligible to moderate.

Development of other minerals potentially present on the proposed lease exchange tract could not occur during mining, but they could be developed after mining. Coal bed methane associated with the coal at the time it is removed would be irretrievably lost during mining. There are currently no actively producing oil and gas wells on the proposed lease exchange tract. The federal rights to the oil and gas underlying the tract are under lease. There are private oil and gas rights underlying the tract, and there are two inactive coal bed methane wells on the tract. Conflict could arise between oil and gas and coal lease holders. BLM manages federal minerals on a multiple use basis in accordance with existing regulations, including 43 CFR 3400.1(b) which provides that "the presence of other minerals...or production of deposits of other minerals shall not preclude the granting of an exploration license, a license to mine or a lease for the exploration, development or production of coal deposits with suitable stipulations for simultaneous operations." The special stipulations that BLM would attach to the lease if this exchange is completed are listed in chapter 2. In the event of a conflict between competing federal lessees, BLM policy is to encourage negotiation and resolution of resource recovery issues between the conflicting interests. BLM would not be involved in development of any private oil and gas leases on the tract.

Scoria is the only mineral (other than coal) known to occur in the area, but no active quarries exist or are proposed. Some scoria may be mined as part of the Proposed Action and sold or used for mine-related roads. Therefore, lease exchange and subsequent mine development would have negligible impacts on mineral resources.

Mine development and operation is not likely to affect the existing Mader Draw or Buck Creek oil fields (located approximately 4.0 miles east of the proposed lease exchange area) because the strata where blasting would occur is dipping gently west away from these fields. Blasting-related seismic waves would likely diminish before reaching the five existing oil wells. Both oil fields are tapping the Minnelusa Formation which is well below the maximum depth proposed for mining.

Coal mining would inconvenience but not preclude future seismic tests for oil and gas reserves because seismic waves do not reliably spread though broken rock (Smithson 1998). Therefore, approximately 599 acres would be added to the area that would be disrupted by surface coal mining making it unsuitable for postmining seismic tests. If the target oil and gas reserves in the area are deeper than about 10,000 feet, seismic tests could be completed by undershooting--setting seismic receivers outside of the rubble zone. Undershooting provides reliable seismic data although it reduces flexibility in locating the seismic tests.

Geologic Hazards

Earthquake potential is low, and facilities and stockpiles would be designed to withstand a moderate earthquake. A magnitude 6.25 earthquake is possible but unlikely, so no impacts from earthquakes are expected.

Map 3-1 in chapter 3 shows a large windblown deposit in section 20. This deposit could be activated by vegetation removal that would cause accelerated soil loss. If feasible, this deposit would be avoided. If it is necessary to disturb this area, disturbance would be minimized and stringent erosion control measures would be implemented to reduce soil loss. The tract discussed under the Proposed Action intersects approximately 33 acres of this deposit.

The unnamed tributary to Hay Creek may occasionally experience flooding, but facilities would be located away from the channel. Proper drainage diversions and stormwater runoff facilities would be installed for the life of the mine; thus, no damage from flooding would be anticipated.

Water Resources

Groundwater

Potential impacts to groundwater as a result of surface coal mining activities include

the following:

- impacts on groundwater availability;
- impacts on static water levels;
- impacts on groundwater quality; and
- impacts on groundwater rights.

Impacts on Groundwater Availability. One of the consequences of surface coal mining is the potential reduction in available groundwater because aquifer materials have been removed. Under the Proposed Action, the Anderson and Canyon coal aquifers and interburden and overburden aquifers would be removed during mining and replaced with a similar mixture of overburden that would have been previously mined and backfilled into the void left after the coal was removed. The physical characteristics of the backfilled overburden would depend on mining methods and premining overburden lithology (Martin et al. 1988). However, research in other coal-mining areas in the northern Great Plains indicates that hydraulic conductivity in the backfilled overburden material would be high enough to consider the material an aquifer (Groenewold 1979).

The final hydraulic conductivity of the backfilled overburden material would approximate the mean values of hydraulic conductivity of the undisturbed Wyodak coal aquifer (0.8 feet per day) (Martin et al. 1988). Given the expected final saturated thickness, the backfilled overburden aquifer would be expected to be able to supply enough water to supply stock wells. This assessment has been confirmed at the Buckskin Mine south of the project area (Triton 1996). The removal of aquifer material associated with the Proposed Action would not significantly change the short- and long-term impacts on groundwater availability in the vicinity of the proposed lease exchange area from what is expected to occur as a result of already permitted coal removal at the Buckskin Mine.

Impacts to Static Groundwater Levels. The rate of aquifer recharge, movement, and discharge of groundwater depends on numerous factors (Martin et al. 1988). Since the project area is near the Buckskin Mine, the coal and overlying aquifers in the proposed lease exchange area are already expected to be impacted by surface coal mining. The Buckskin Mine has conducted detailed groundwater studies using the MODFLOW computer model to predict the extent of groundwater drawdowns (Triton 1996). Based on these predictions, the existing Buckskin Mine will produce a five-foot drawdown extending approximately 2 miles north of the current permit boundary. The five-foot drawdown area includes all lands that would be included in the Proposed Action. Detailed groundwater studies have not been prepared for the Proposed Action; however, there are no geographic, geologic, or hydrologic factors present that would indicate that groundwater drawdown impacts would be significantly different from those already identified and predicted for the Buckskin Mine. Therefore, mining lands included in the Proposed Action would initially result in removing all

Wyodak aquifers and most likely a 2-mile expansion of the 5-foot aquifer drawdown area for the area beyond the current limits predicted in the Buckskin Mine permit renewal document on file with WDEQ/LQD in Sheridan and Cheyenne.

Drawdown impacts would begin once the aquifer material is disturbed and removed and would continue until backfilling is complete and the aquifer is recharged. After reclamation, water levels in the various Wyodak aquifers would begin to recover and would eventually reach equilibrium. Detailed groundwater studies would be prepared for the Proposed Action. Also, detailed estimates for the amount of time required for complete recovery of the postmining potentiometric surface would be made during the permitting process. There are no geographic, geologic, or hydrologic factors present that would indicate that the amount of time required for complete recharge of the Wyodak aquifer in the project area would be significantly different from the 1,500 years predicted for the Buckskin Mine as permitted (Triton 1996).

Based on this evaluation, removing all affected aquifer material associated with the Proposed Action would have moderate short- and long-term impacts on the static water levels of groundwater in the proposed lease exchange area and vicinity.

Impacts to Groundwater Quality. Removing coal in the project area could result in changes in groundwater quality (Martin et al. 1988). The potential deterioration of water quality could result from communication between the reclaimed aquifer and undisturbed aquifers, changes in recharge-discharge conditions, and groundwater flow patterns. However, Martin et al. (1988) point out that current and future water from reclaimed spoil aquifers would meet Wyoming state standards for livestock, which is one of the uses of water from all aquifers within the area. This conclusion is based on 336 chemical analyses of water samples collected from 45 wells completed in spoil aquifers at 10 existing mines.

Results from column leachate studies indicate that TDS concentrations in backfill wells would be similar in quality to water from the alluvial aquifer to which the spoil aquifers would eventually discharge (Martin et al. 1988). Although no site-specific studies have been conducted for the project area, water quality in the spoil aquifer would be expected to be within the range of alluvial groundwater quality in the area. Therefore, impacts to groundwater quality in Hay Creek or its alluvial aquifer would be negligible. This assessment has also been confirmed for the Buckskin Mine south of the proposed lease exchange area (Triton 1996). Thus, impacts on groundwater quality that would occur as a result of the already permitted coal removal at the Buckskin Mine would not significantly change under the Proposed Action.

Impact to Groundwater Rights. Of the 126 existing groundwater rights on or within 2 miles of the proposed lease exchange area, 122 water rights were established for monitoring groundwater levels and quality. All of these water rights were previously identified as possibly being impacted by approved mining at the Buckskin Mine,

including the two domestic water rights and the two livestock water rights (Triton 1996). Under Wyoming state law, pre-existing water rights are protected from human interference or other affects such as changes in water quality (WS §41-3-907). If the Proposed Action were approved and mining activity did impact any pre-existing water rights, the project proponent would be responsible for mitigating any identified impacts. The WDEQ/LQD and the WSEO would also ensure that any necessary mitigation measures are fair and reasonable. Mitigation measures might include well replacement, redrilling the existing well, or providing any alternative source of water that meets the quantity and quality of the existing water well. The short- and long-term impacts to the groundwater rights as a result of the Proposed Action would not seriously change from what is expected as a result of approved mining activity at the Buckskin Mine.

Surface Water

Potential impacts to surface water resulting from surface coal mining activities include:

- impacts to the surface drainage patterns;
- impacts to Hay Creek surface stream flow; and
- impacts to surface water quality.

Impacts to the Surface Drainage Patterns. The tributary drainages of Hay Creek that would be impacted by the Proposed Action are shown on map 3-2 in chapter 3. Approximately 0.92 square miles (6%) of the Hay Creek drainage basin would be directly impacted under the Proposed Action. In addition, current mining operations at the Buckskin Mine are expected to impact approximately 0.92 square miles (6.1%) of the Hay Creek drainage. Under the Proposed Action, the size of impacts to downstream tributary drainage basins already impacted by the Buckskin Mine would increase. The Proposed Action and current mining at the Buckskin Mine would have a cumulative impact on approximately 1.83 square miles (12.1%) of the Hay Creek drainage.

Before mine-related activities begin, the project proponent would prepare a permit amendment for WDEQ/LQD that would include detailed analyses for all surface water sources that would be impacted by mining-related activities. The permit amendment would be prepared in accordance with WDEQ/LQD rules and regulation (1998) and WDEQ/LQD Guideline No. 8 (1994a). All disturbed areas would be reclaimed when mining is completed. WDEQ/LQD rules and regulations require backfilling, recontouring, retopsoiling, revegetation, and reestablishing surface drainage patterns. All major reclaimed channels would have to meet specific design standards to ensure that they are both hydraulically and erosionally stable. Any additional portion of the Hay Creek drainage basin that would be impacted by surface mining under the Proposed Action would be reclaimed in such a manner that the essential hydrological

functions of the drainage basin are restored. Therefore, the short- and long-term impacts to surface drainage patterns would not be notable.

Impacts to Surface Water Flows in Hay Creek. Impacts to surface water flows in Hay Creek under the Proposed Action would result from temporarily removing surface water from portions of the drainage basin. Before mining begins in the proposed lease exchange area, the project proponent would develop a plan to protect surface water quality on lands not directly impacted by the Proposed Action. The primary method used by surface coal mines in the PRB is sedimentation control ponds. Interceptor channels divert surface water flows from the affected area to the sedimentation pond. This prevents additional sediment generated when topsoil and overburden are removed or during precipitation events from entering downstream stream channels. As a result of these diversions, surface waters from affected lands on the existing mine or the proposed lease exchange tract that would normally reach Hay Creek would be temporarily collected in the sedimentation control pond until WDEQ/WQD water quality standards are met, after which the water would be evacuated from the pond and returned to the natural channel. Therefore, removing surface water from Hay Creek due to the Proposed Action would be temporary and would have negligible impacts on the total flow of Hay Creek.

The WDEQ/LQD would require the project proponent to remove the sedimentation control structures, reclaim the ponds and any associated channels, and allow all surface waters to drain to Hay Creek unimpeded. This would be done once mining and reclamation operations are complete and the erosional and hydraulic stability of the reclaimed surfaces are determined to meet success standards.

The applicant would also be required to obtain the legal water rights from the WSEO to remove or distribute surface waters from Hay Creek for pollution control purposes (WSEO 1974). Surface water rights would exist as long as sedimentation structures are required. Once the sedimentation structures are removed, surface water rights would revert to the state of Wyoming.

Impacts to Surface Water Quality. The primary impact on surface water quality from surface mining would be increased soil erosion from disturbing the vegetation and soil. Increased soil erosion would occur when topsoil soil or overburden are disturbed and exposed to the erosive powers of rainfall energy and flowing water (Barfield et al. 1987). However, both state and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards. During mining and reclamation under the Proposed Action, sedimentation ponds would capture all runoff. The water would be temporarily held until water quality standards are reached, after which the water would be discharged back into natural channels (WDEQ/LQD 1998). Analytical results of pre- and post-discharge water quality would be maintained and submitted to the appropriate regulatory agency. Although surface mining operations could have adverse impacts on surface water quality, complying with and enforcing

stringent state pollution control rules and regulations administered by WDEQ/LQD and WDEQ/WQD would prevent any significant short- or long-term impacts to surface water quality outside of the proposed lease exchange area.

Impact to Surface Water Rights. None of the eight existing surface water rights within the proposed lease exchange area appear to be used for either irrigation or domestic purposes. Under Wyoming state law, pre-existing water rights are protected from human interference or other effects such as changes in water quality (WS §41-3-907). If the Proposed Action were approved and mining activity were to impact any pre-existing water rights, the project proponent would be responsible for mitigating those impacts. The WDEQ/LQD and the WSEO would also ensure that any necessary mitigation measures are fair and reasonable. Mitigation measures might include replacement with an alternative surface water source that meets the quantity and quality of the existing water source. Therefore, the short- and long-term impacts to the surface water rights as a result of the Proposed Action would be negligible.

Wetlands

Wetlands would be avoided where possible, and unavoidable disturbance would be limited to that which is necessary to develop and operate the mine. As part of the permit to mine, jurisdictional wetland delineations would be completed in all areas to be disturbed. A wetland mitigation plan would be developed in consultation with WDEQ and the COE for implementation during final reclamation. The plan would ensure that jurisdictional wetlands would be restored acre-for-acre (or more) and wetland values and functions (hydrologic and ecologic characteristics) would be similar to premine conditions. Replacement of functional wetlands may occur in accordance with agreements with the private surface owners; no federal surface lands are included in the proposed lease exchange tract. During the period of time after mining and before restoration of wetlands, all wetland functions would be lost. The restored wetlands may not duplicate the exact function and landscape features of the premine wetlands.

Mining would cause the direct loss of approximately 4.8 acres of jurisdictional wetlands under the Proposed Action (map 3-3 in chapter 3). Wetlands associated with the springs or other groundwater discharge points could be adversely affected due to aquifer dewatering. It is possible that surface water diversions could impact wetlands if a surface water source for wetlands is diverted. If the indirect effects of groundwater loss impacted every potential wetland in the area, up to 4.8 acres of wetlands would be lost until they were restored by mitigation. Indirect wetland losses would be monitored during the life of the mine and the acreage, values, and functions of these wetlands would be mitigated as required by WDEQ and the COE.

Impacts caused by wetland disturbance would include loss of:

- important biological sites for food chain production, wildlife habitat, nesting, rearing, and resting sites for aquatic and land species;
- natural storm and floodwater storage areas;
- groundwater recharge and discharge areas;
- wildlife watering areas;
- water purification sites; and,
- natural sedimentation and salt deposition sites.

Alluvial Valley Floors

Impacts to designated AVFs are not permitted if the AVF is determined to be significant to agriculture. If the AVF is determined not be significant to agriculture it can be mined but must be reclaimed. WDEQ/LQD would require the mine operator to re-establish the hydrological function of the reclaimed AVF and any AVFs located outside of the mine area that might be impacted. If an AVF is present, the final determination of its agricultural significance would be made by the WDEQ/LQD based on specific calculations related to the size of the AVF and the size of the existing operation on the lands to be permitted. During the WDEQ/LQD permitting process the public is also provided an opportunity to comment on the specific AVF determination under consideration.

If nonagriculturally significant AVFs are identified during the permitting process, WDEQ/LQD permitting procedures would require the project proponent to restore the essential hydrologic function of the AVFs located both on and outside of the affected lands during reclamation. The reclaimed AVF area would also undergo regulatory review during the reclamation bond release process to ensure that AVF reclamation requirements specified in the mine permit have been completed. In general, impacts to AVFs could include water table drawdowns, changes in surface water flow patterns, and changes in the interaction between surface water and groundwater resources. It is unlikely that any AVFs occur in the proposed lease exchange area that are significant to agriculture because of the lack of agricultural activity in this area. Any other AVFs would be restored so that impacts would be negligible to moderate.

Soils

Soil disturbance would be limited to only what is necessary for mine development and operation. Reclamation would be completed in the first appropriate season after a disturbed area is no longer needed for operations. A detailed soil survey where soils are mapped, classified, and sampled to determine appropriate salvage depths and to identify any physical and/or chemical limitations that would adversely affect reclamation potential would be completed as part of the mine permit revision if this exchange is completed. As a result of the survey, a topsoil handling plan would be

developed so that only suitable soils (as defined by WDEQ/LDQ) would be used as a plant growth medium during reclamation. The proponent would be required to post a bond which would be held until reclamation success standards, including soil stabilization, have been met. Although soils would be impacted from mine development and operation, long-term productivity (in support of postmining land uses) would be maintained; impacts would be negligible to moderate.

Mine development and operation would directly affect 840 acres within the proposed lease exchange area under the Proposed Action. The following impacts would be anticipated:

- soil mixing would cause homogenization of soil physical and chemical properties;
- soil removal and stockpiling would cause disruption of soil biology;
- wind and water erosion would cause permanent soil loss;
- sensitive (alkaline) soils would be difficult to reclaim; and,
- soil compaction would cause decreased productivity.

Other possible impacts would be accidental hazardous material spills which could contaminate the soil.

Mixing of Physical and Chemical Properties

Mixing of soil materials is an unavoidable impact, but careful handling of topsoil should avoid undesirable changes in chemical and physical soil properties. With proper materials handling long-term soil productivity should be impacted. Post-reclamation soils would be much more uniform in texture, structure, depth, color, organic matter content, chemical composition, and other physical and chemical properties when compared to premining soils. These impacts would be long-term--continuing well beyond the life of the mine--until soil characteristics are reestablished via soil development through natural processes. Replaced soils are expected to support proposed postmining land uses.

Disruption of Soil Biology

Impacts to soil biological functions would be short-term for topsoil that is directly backhauled and long-term for soils that are stockpiled. Short-term impacts would include major disruptions to soil biologic activity but little mortality or loss of organic matter. Long-term impacts would include a reduction in soil organic matter and mortality of microbial populations, seeds, bulbs, and live plant parts.

Soil Loss Via Wind and Water Erosion

Soils with severe erosion potential are widespread within the area. Under the Proposed Action, 840 acres would be disturbed and exposed to potential for accelerated soil loss via erosion. Soil loss and the potential for maintaining long-term productivity would depend on site-specific conditions. With the effective implementation of the mitigation measures required in the permit, loss would be negligible, and long-term productivity would not be affected.

Reclamation of Sensitive Soils

Certain soils would be more difficult to reclaim due to chemical or physical limitations which include steep slopes, alkalinity, high proportions of rock fragments, and high clay content. These soils would be handled in accordance with the topsoil handling plan approved by WDEQ/LDQ so that long-term productivity is maintained throughout the area.

Soil Compaction

During topsoil replacement soils would be compacted due to heavy equipment traffic. Compaction decreases the volume of air and water in the soil profile and results in a short-term decrease in productivity. Soil compaction reduces infiltration and increases surface runoff. Short-term increases in erosion may occur until adequate vegetation is reestablished.

Possible Contamination from Hazardous Material Spills

No significant adverse impacts due to accidental spills of petroleum products, discharged mine-water, or other pollutants are expected. Hazardous materials would be properly contained, facilities would be located away from drainage areas, and the proponent would adhere to approved spill prevention, control, and countermeasures plans.

Vegetation

Plant Communities

Vegetation disturbance would be minimized to that which is necessary for mine development and operation. Reclamation would be completed in the first appropriate season after a disturbed area is no longer needed for operations. As part of the mining permit revision a detailed reclamation plan would be prepared that would include procedures for establishing self-sustaining plant communities and standards for revegetation success. The proponent would be required to post a reclamation bond

which would not be released until revegetation success standards have been met. Impacts to vegetation would be moderate under the Proposed Action.

Impacts would include: vegetation removal; long-term changes in species composition and diversity; long-term conversion of shrublands to grasslands while reclaimed areas are reestablishing; loss of forage for wildlife and livestock; wildlife habitat loss; and possible weed infestations.

Under the Proposed Action, 840 acres of additional vegetation would be removed. Interim reclamation would occur concurrently with mining so the disturbance acreage would vary over the life of the mine. Areas disturbed for coal removal (pits) would be exposed for three years before reclamation.

Long-term effects on species composition and diversity and long-term conversion of shrublands to grasslands are unavoidable adverse effects that would occur wherever vegetation is removed. Reclaimed lands would be dominated by grasses initially and fewer species would be present; thus, diversity would be lower than what it was before mining. A varied, productive, and permanent vegetative cover--capable of supporting proposed postmining land uses--would likely be established within approximately 10 years following reclamation (USDI, BLM 1997a) depending on climate, soils, grazing pressure, and other factors affecting reclamation success. Productivity may be higher on newly reclaimed areas because grasses and forbs produce biomass more quickly than shrubs. WDEQ/LQD would require the proponent to restore at least one shrub per square meter over 20% of the disturbed area and to demonstrate that shrub communities are self-sustaining prior to bond release. This standard would support the anticipated postmining land uses of grazing and wildlife habitat. Restoration of sagebrush to premining levels would take an estimated 20 to 100 years (USDI, BLM 1997a).

Threatened, Endangered, and Candidate Plant Species

No threatened, endangered, or candidate plant species occur in the proposed lease exchange area; therefore, there would be no impacts as a result of the Proposed Action.

Wildlife

Local wildlife populations would be directly and indirectly impacted by mining the proposed lease exchange area in both the short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). During mining, many species of wildlife would be displaced to other areas. When animals are displaced, they may find equally suitable habitat that is not occupied, occupy suitable habitat that is already being used, or occupy poorer quality habitat than that from which they were displaced. In the latter two situations displaced

animals suffer from increased competition and are less likely to survive and reproduce. These consequences are difficult to quantify and are influenced by unpredictable factors such as weather.

Big Game

Antelope and mule deer would be directly affected by mining activities in the form of road kills resulting from increased continuing vehicular traffic. Indirect impacts of surface coal mining would include temporary habitat loss, displacement, and harassment mining, but they would acclimate over time. Animals would be displaced from the area during mining. Alterations in vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity after mining and reclamation. Sagebrush would gradually become reestablished on the reclaimed land; however, it would take many years and, depending on land use priorities, may never reach premining densities. The reduction in food and cover would displace big game to adjacent ranges. Habitat loss would be incremental, occurring over five years and allowing for gradual changes in big game distribution patterns. Big game residing in adjacent areas would be impacted by increased competition from displaced animals. Since no crucial big game range occurs in the area and the disturbed area (840 acres) comprises only 0.1% of antelope range and 0.03% of mule deer range in the respective herd units, impacts would not be notably different from what is expected to occur as a result of already permitted coal removal at the Buckskin Mine.

Noise, dust, and associated human presence would also cause some avoidance of foraging areas adjacent to mining activities. However, big game animals are highly mobile and can move to undisturbed areas if movements are not restricted. In addition, big game species have continued to occupy areas adjacent to active mine operations, suggesting that they become habituated to many such disturbances.

Additional adverse impacts to pronghorn would be barriers to movement created by additional fences, spoil piles, and pits related to mining the area. To the extent possible, fencing would be designed to permit pronghorn antelope passage, but in some areas the hazard would remain. During severe winter storms pronghorn may not be able to negotiate these barriers, and some mortality could occur. However, the proposed lease exchange area is not in a major migration corridor, and such impacts would be negligible.

Other Mammals

Direct losses to small mammals would be higher than for other wildlife since their mobility is limited and many would retreat into burrows when disturbed. Mammals such as coyotes and rabbits would be temporarily displaced to adjacent habitats where they may or may not survive depending on existing populations on those areas.

Following reclamation they would reinvade reclaimed lands as appropriate habitat developed. Populations of less mobile animals (such as mice) would decline during mining due to direct mortality and habitat destruction in the area. However, these animals have a high reproductive potential and tend to become reestablished quickly in reclaimed areas.

Upland Game Birds

Mining would eliminate potential sage grouse habitat. However, relatively few sage grouse have been observed using the area during annual wildlife monitoring surveys. There is one lek within approximately 0.5 mile of the proposed lease exchange area. It is not likely that the lek would be disturbed, but adjacent nesting and brood-rearing habitat would be lost during mining.

Raptors

It is unlikely that raptor populations would be detrimentally impacted by mining the area; however, individual birds may be impacted. Several raptor nests (both active and inactive) occur near the proposed lease exchange area. Mining-related disturbance could cause these raptors to abandon their nests. Before mining would occur, the existing raptor mitigation plan would be modified to include the proposed lease exchange tract as part of the revised mining plan (which would be reviewed and approved by the FWS). Any nests that would be impacted by mining operations would have to be relocated in accordance with that plan. Before disturbing any raptor nest, special purpose permits would have to be secured from the FWS and WGFD. All active raptor nests within the mine permit area would be further protected by buffer zones.

Foraging habitat for raptors in the area would be reduced until revegetation successfully attracts small mammals and birds which serve as their prey. All power lines would be made raptor safe (Avian Power Line Interaction Committee 1994), and successful revegetation would likely support rodent and cottontail/jackrabbit (prey) populations.

Raptor sightings have declined, and reproductive rates are presently depressed in the area according to monitoring conducted by WGFD, BLM, and FS; populations may be decreasing. The decline in raptor numbers could be a result of the cumulative impacts associated with coal mining, oil and gas activity, and an increasing human presence in the PRB.

Other Birds

Based on annual surveys, no migratory birds of high federal interest regularly use the area, and raptors are the only MBHFI that breed in the area. Thus, extending mining

onto the proposed lease exchange tract would have insignificant impacts on these species.

WDEQ and the COE would require creation of jurisdictional wetlands in an amount equal to those destroyed during mining. The area currently has limited value for waterfowl production; thus, impacts to waterfowl would be negligible.

Resident songbirds would have to compete for available adjacent territories and resources as their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. These effects would be short-term for grassland species but would last longer for shrub-dependent species.

Threatened, Endangered, Candidate, and Sensitive Animal Species

Mining the proposed lease exchange area would not be likely to affect any T&E, candidate, or sensitive animal species because none occur in the area. In addition, no critical habitat for any T&E species occurs on the proposed lease exchange area.

Cultural Resources

The National Historic Preservation Act of 1996 (36 CFR 800) requires consideration of cultural resources which may be affected by direct surface-disturbing activities as well as indirect effects from such operations. Previous Class III inventories have been conducted within most of the land proposed for exchange. Class III surveys would be required for uninventoried lands in the west-southeast of section 20 before any development could occur. A Class I survey would be required to confirm the evaluation and location of sites inventoried previously but for which SHPO concurrence was not obtained within other areas of development. A total of five sites have been recorded in the proposed lease exchange area. Three of the sites are not considered eligible for inclusion on the NRHP, one site is considered eligible for the NRHP, and one site has not been evaluated. SHPO concurrence has not been obtained for any of the sites.

No properties currently listed in the NRHP occur within the proposed lease exchange area. After SHPO concurrence, sites requiring further consideration would include those which are considered eligible for the NRHP and sites of undetermined status which lack sufficient information to assess NRHP eligibility. If avoidance of sites of undetermined status is not feasible, information must be obtained to provide a NRHP evaluation before disturbance. If avoidance is not possible for sites considered as eligible for the NRHP, mitigation would be required. Mitigation may include data recovery excavations, detailed mapping, historic research, or other appropriate technique, and would be guided by a data recovery plan submitted to BLM and SHPO with consultation with the Advisory Council on Historic Preservation.

Inadvertent/unintentional impacts to an eligible site would be the responsibility of the applicant and could require mitigation.

No sites of Native American religious or cultural importance have been identified to date. If such sites or localities are identified at a later date, they will be taken into consideration.

Paleontological Resources

Under the Proposed Action, 840 acres of land would be disturbed. Fossils of scientific significance are not likely to be directly (destroyed by mining) or indirectly (collected by unauthorized personnel) impacted by the project because there is low potential that important paleontological resources occur in the area.

Predevelopment paleontological surveys would be conducted as part of the mine permit application, and any paleontologic sites would be avoided or mitigated prior to disturbance. A paleontological resource discovered by mine workers would be immediately reported to BLM as required under the special lease stipulation that would be attached to the lease if this exchange is completed. All construction operations within 50 feet of such a discovery would be suspended as required by BLM regulations until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery would be made by the authorized officer to determine appropriate actions to prevent the loss of significant paleontologic values.

Visual Resources

The VRM classification of the proposed project area (Class IV) allows for changes in the landscape such as surface mining. Visual impacts would be evident during mining; however, mining activity on lands included in the Proposed Action would generally not be visible from any major travel routes and would be partially concealed by surrounding terrain. No unique visual resources are found on lands to be included in the Proposed Action. Removing and stockpiling overburden, removing coal, and construction of required support facilities would require major modifications of landforms within the affected area. However, stringent approximate original contour regrading and revegetation regulations promoted and enforced by WDEQ/LQD require that lands affected by surface mining be restored to essentially premining conditions. Current mining activities at nearby surface coal mines have already affected visual resources on lands to be included in the Proposed Action. The additional cumulative increment of surface mining on the lands included in the Proposed Action, when compared to current visual classifications, would not be significant.

Noise

Noise levels on the proposed lease exchange area would be increased by mining activities such as overburden and coal blasting, removal, and hauling. The nearest residence, a ranch house located next to county road 17-23, is approximately 11,000 ft (2.1 miles) west of the proposed lease exchange area and the proposed lease exchange area is approximately the same distance from public access as the existing Buckskin Mine operation. As part of the mine permitting process, WDEQ/LQD would assess noise and ground vibrations associated with any proposed permit amendment. As discussed in chapter 3, typical ambient noise levels at an operating mine are in the 40 to 60 dBA range for a 24-hour period and within 50 feet of the operation the maximum noise level could reach or exceed (85 to 95 dBA). The WDEQ/LQD have set a maximum noise level of 129 dBA for any dwelling, public building, school, church, and community or institutional building outside of an approved permit area (WDEQ/LQD 1998). The maximum noise from a surface coal mine is generally associated with overburden or coal blasting. The OSM, as part of a report for the Caballo Rojo Mine located in the PRB, determined that the peak noise associated with blasting would be approximately 123 dBA at the blast site and approximately 40 dBA 1,230 feet from the blast.

Because the nearest dwelling proposed lease exchange area would be more than eight times the distance documented by OSM to obtain a 40 dBA reading, blasting would not be expected to exceed WDEQ/LQD regulatory standards for noise. The primary noise-related impact from the Proposed Action would be the extended period of time noise would occur during mining and reclamation. Noise would have little additional off-site effect because of the remoteness of the area and because mining has already been permitted in the general area. Wildlife in the immediate vicinity of mining may be adversely affected; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to increased noise associated with active coal mining. Any increased noise would be reduced to premining levels after mining and reclamation operations have been completed. Impacts due to noise from the Proposed Action would not be significantly different from what is expected to occur as a result of already permitted coal removal at the Buckskin Mine.

Air Quality

The amount of air increment used by a particular operation is highly dependent upon the type of operation, the types of equipment, and the mining sequence. Under the Proposed Action, the air quality impacts would not be significantly different from those that would occur when the Buckskin Mine reaches full production of 18 million tons per year under the current mine plan. It is assumed that the lease exchange tract would be used to increase the length of time during which full mine production occurs. No changes in mining methods are proposed if future mining operations include the lease exchange tract. There would not be additional sources of fugitive dust. The relative

locations of emission sources, such as topsoil removal areas, haul roads, and active pit areas, would change but the numbers and types of sources would not. If the lease exchange is mined as part of the existing mine, Buckskin has said they plan to use conveyors to move coal from this area to the preparation plant, so dust emissions are relatively independent of the distance from the pit to the plant.

Blasting, another source of emissions, would not increase significantly because the overburden thickness in the lease exchange area is similar to overburden thicknesses on the existing Buckskin Mine.

If this lease exchange is completed, an air quality permit revision would have to be submitted to and approved by WDEQ/AQD before any mining could occur on the proposed lease exchange area. The air quality permit revision application would include: mine production rates; disturbance, mining, and reclamation schedules; maps indicating the specific areas to be affected; and the results of the computer modeling conducted for the proposed lease exchange area. The permit revision would address all regulatory requirements for PM_{10}, TSP, and PSD.

The WDEQ/AQD has issued Buckskin Mine an air quality permit for an authorized maximum production of 22 million tons of coal per year (Warren 1999), but the actual production rate would depend on market conditions and coal sales contracts. Since mining under the Proposed Action could serve as an extension of existing mining operations, it would probably only extend the life of the existing Buckskin Mine rather than result in an actual increase in mine production above the currently permitted level of production. No significant changes in impacts to climatology or air quality resources from what is expected to occur as a result of already permitted coal removal at the Buckskin Mine would be anticipated under the Proposed Action.

The net short-term effect on air quality would be determined ultimately through monitoring. Blasting is not a major source of PM_{10} emissions at the Buckskin Mine. The PM_{10} fugitive emissions inventory for PRB mines shows that overburden and coal lasting generally comprise less than 1% of the total PM_{10} emissions at the mine. The major emission sources are overburden removal, wind erosion, and coal haul roads.

The nearest Class I area, Wind Cave National Park, is located approximately 120 miles southeast of the proposed coal lease exchange area. If this coal lease exchange is completed, the impacts of mining the proposed lease exchange area on the nearest Class I areas are not expected to be significantly different that the impacts that will occur as a result of currently permitted mining activity at the Buckskin Mine.

In summary, the Buckskin Mine is operating within the requirements of their current air quality permit. The proposed lease exchange tract would be mined using similar equipment and similar emission control methods. The overburden and coal thicknesses on the lease exchange area are similar to the parts of the existing coal

leases now being mined. The mine does not propose to increase production above the currently permitted maximum rate of 22 million tons per year, with or without the lease exchange, but acquisition of the lease would allow production at the planned rate of 18 million tons for a longer period of time. As a result, the air quality impacts of mining the proposed lease exchange would not be significantly different than those predicted for mining at the existing mine at the permitted rate. Mining the lease exchange would extend the period of maximum production and result in relocation of some emission sources over time. Before the proposed exchange area could be mined, an amendment to the current Buckskin Mine air quality permit would need to be approved by WDEQ/AQD.

Land Use

Agriculture/Rangeland

During mining, portions of the area would be unavailable for livestock grazing and wildlife habitat. Assuming that disturbance to rangeland and hayland would occur proportionally to their occurrence in the proposed lease area, 579 acres of rangeland would be disturbed and an estimated 116 to 193 AUMs would be lost under the Proposed Action. Newly reclaimed lands would be temporarily fenced to exclude livestock until vegetation is established, and fences may block livestock access to other grazing lands. Thus, mining would result in a larger area of restricted use. Under the Proposed Action, an estimated 30 acres of hayland would also be disturbed.

Extractive Mineral Operations/Oil and Gas Production

There are three abandoned deep oil and gas wells on the proposed lease exchange tract, however, none of these wells were completed as producers so it is unlikely that they contain any production equipment that would have to be removed before mining. There are two recently drilled coal bed methane wells on the proposed lease exchange area; however, no production has been reported for these wells and their status is unknown. If economic coal bed methane production is established in these wells, the coal lessee would have to negotiate with the coal bed methane lessees (federal and nonfederal) regarding the value of the gas resource and production facilities, and the production facilities would have to be removed before mining. New drilling would not be possible in areas of active mining, but could take place in areas not being mined or in reclaimed areas. Any coal bed methane resources on the proposed coal lease exchange tract would be lost when the coal is removed.

Triton Coal Company has conferred with the coal bed methane operator in this area (Redstone Resources)[4]. They (Redstone) state that they have no interest in any potential methane that may be associated with this specific coal. Apparently this coal is located close to the outcrop so that the methane (if present) is venting naturally. Coal bed methane exploration on this lease has failed to locate methane in commercial quantities.

Recreation

Because surface lands are privately owned there is little public access to the area. Public access would continue as it exists today, except that access would be denied near active mining operations to ensure public safety. Hunters and other recreationists would be permitted in unmined portions of the project area with landowner permission, and such access would not be unreasonably withheld. Noise and visual intrusions associated with mining would detract from the attractiveness of the project area for such activities during the life of the mine. Recreationists would be excluded from much of the proposed lease exchange area under the Proposed Action.

Socioeconomics

Exchange and subsequent mining would not create additional jobs if mined as a maintenance tract, but the life of an already permitted operation would be extended by five years. During these five years the mine would provide about 150 jobs with an annual payroll and benefit package of $10.5 million. Leasing and mining as a production maintenance tract would not be expected to alter current employment levels. Coal prices are projected to remain relatively constant throughout the life of the mine (Wyoming Geological Survey [WGS] 1996), and the total direct fiscal benefit to the state of Wyoming from coal mining (taxes and royalties) has been estimated at $1.10 per ton of coal mined (UW 1994). Thus, the sale of 101 million tons of coal under the Proposed Action would generate $111 million to the state. Assuming a price of $4.00 per ton, the market value of the coal would be about $404 million for the Proposed Action. The estimated economic multiplier for determining the total economic impact to the local area (direct, indirect, and induced effects) range from 1.473467 (UW 1994) to 1.796 (Campbell County Economic Development Corporation 1993). Applying an average economic multiplier of 1.5 to these revenues, the total economic impact from leasing and subsequent mining would be about $606 million for the Proposed Action. These economic impacts would benefit the local, regional, and state economies.

No additional internal or external mine transportation facilities (out of pit haulroads, public roads, or railroad spurs) would be required or constructed, and no

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[4]Please see letter 4, comment (b).

transportation facilities would be terminated or relocated under the Proposed Action. The Proposed Action would not increase the current level of use or impacts on any local state and county roads other than extending the period of time they would be used. Therefore, the short- and long-term impacts to transportation facilities as a result of the Proposed Action would be negligible.

In the PRB, the coal reserves currently leased represent a small percentage of the total coal reserves, but a large percentage of those shallow reserves that are the most economical to recover. Removing this coal is an irreversible and irretrievable impact. PRB coal was used to generate electricity for the public in 19 states and Canada in 1995. People in those states benefit from the low utility rates related to the price of coal, from the clean air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal. Locally, continued sale of PRB coal helps support and maintain stable municipal, county, and state economies.

Hazardous and Solid Waste

If this lease exchange is completed and the proposed lease exchange tract is mined, the wastes that would be generated in the course of mining the tract would be similar to the wastes that are currently being generated by the existing mining operation. Procedures for handling hazardous and solid waste are in place at the existing Buckskin Mine. Wastes generated by mining the proposed lease exchange tract would be handled in accordance with the existing regulations using the procedures currently in use at the Buckskin Mine.

IMPACTS OF THE NO ACTION ALTERNATIVE

Should the proposed lease exchange tract be mined as part of the existing Buckskin Mine, the impacts associated with extending the life of the existing Buckskin Mine by five years would be avoided, at least in the short term. The potential income from future royalties and taxes on 106 million tons of coal, and the economic benefits of five additional years of operation by the Buckskin Mine, would be foregone. A portion of the surface of the proposed lease exchange area (about 142 acres) would be disturbed due to overstripping to mine the contiguous Buckskin coal lease.

Topography and Geology

Topography/Physiography

Under the No Action Alternative, topography would continue to be affected at current rates from ongoing natural processes (erosion and weathering). The No Action Alternative would not preclude future leasing of the area. If this were to happen, impacts similar to those in the Proposed Action would occur. A portion of the surface

of the proposed lease exchange tract would be disturbed in order to mine the coal in the adjacent federal coal lease owned by the Buckskin Mine.

Geology and Minerals

The No Action Alternative would preclude coal mining on the proposed coal lease exchange tract at this time. The resource is currently economically feasible to mine in conjunction with Buckskin. The coal could be leased and mined in the future as a stand alone operation. Oil and gas exploration would not be precluded. Scoria development would remain a potential.

Geologic Hazards

No risks associated with geologic hazards would occur in the Hay Creek tract under the No Action Alternative. Selection of the No Action Alternative would not preclude future leasing, and the same hazards as described for the Proposed Action would be present.

Water Resources

Groundwater

Under the No Action Alternative no lease exchange or mining would occur. This does not preclude future leasing of the coal, at which time impacts similar to those discussed for the Proposed Action would occur.

Surface Water

Under the No Action Alternative no lease exchange or surface coal mining would occur at this time. However, this does not preclude future leasing, at which time impacts similar to those discussed for the Proposed Action would occur.

Wetlands

Under the No Action Alternative, wetlands would not be impacted by mining activities. However, this does not preclude future leasing and mining which would result in impacts similar to those for the Proposed Action.

Alluvial Valley Floors

Under the No Action Alternative, no AVFs would be disturbed because there would be no lease exchange or mining. However, if the area were leased in the future, AVFs would be identified and, if present, either avoided or mitigated.

Soils

Productivity would remain at present levels and soil erosion would continue at present rates because there would be no lease exchange or mining. However, this does not preclude future leasing and exposure to the impacts described for the Proposed Action.

Vegetation

No impacts to vegetation would occur from mine development and operation as a result of the No Action Alternative because no lease exchange or mining would occur. If the area were leased in the future impacts similar to those described in the Proposed Action would occur.

Threatened, Endangered, and Candidate Plant Species

Under the No Action Alternative there would be no lease exchange or mining. Because there are no threatened, endangered, and candidate plant species in the proposed lease exchange area, there would be no impacts.

Wildlife

Under the No Action Alternative there would be no additional disturbance in the area. This would not preclude future leasing, at which time impacts would be similar to those described for the Proposed Action. Wildlife populations would be controlled by natural factors such as weather and, in the case of some animals, by hunting and trapping regulations.

Cultural Resources

Under the No Action Alternative there would be no lease exchange and no mining. Impacts to existing cultural resources would include weathering and vandalism. If the area were leased in the future, the impacts described for the Proposed Action would likely occur.

Paleontological Resources

Direct effects to paleontological resources on the proposed lease exchange tract would not occur under the No Action Alternative; indirect effects of unauthorized collection would continue to occur at present, very minimal, rates. The potential to discover important paleontological resources during premine surveys would be lost; however, the potential that important fossils occur in the area is low so important discoveries are unlikely. If, in the future, the area is leased and mined for coal,

impacts to paleontological resources would be similar to those described for the Proposed Action.

Visual Resources

The No Action Alternative would not alter the viewshed. If the area were leased for coal in the future, visual impacts would be similar to those described for the Proposed Action.

Noise

Under the No Action Alternative there would be no lease exchange or mining, and no noise would be generated from the proposed lease exchange area. If, in the future, the area were leased for coal mining, noise impacts would be similar to those discussed for the Proposed Action.

Air Quality

Under the No Action Alternative there would be no lease exchange or mining, so impacts to air quality would continue as at present. Should the area be leased for coal in the future, impacts would be similar to those described for the Proposed Action.

Land Use

Under the No Action Alternative, current land uses would continue, and potential for mineral, oil, and gas exploration and development would not be temporarily curtailed. If, in the future, the area is leased and mined for coal, impacts would be similar to those described for the Proposed Action.

Socioeconomics

Under the No Action Alternative the economic benefits described for the Proposed Action would not be realized. If the area is leased and mined in the future, socioeconomic impacts would be similar to those described for the Proposed Action.

RESIDUAL IMPACTS

Despite reclamation planning and implementation of mitigating measures, there are impacts of mining that remain after reclamation is completed. The residual impacts on the proposed lease exchange tract would be expected to be similar in nature and scope to the residual impacts for the existing mine. If the proposed lease exchange area is mined, the size of the area of disturbance at the Buckskin Mine would increase.

Topography and Geology

Topography/Physiography

The mean elevation of the proposed lease exchange area would be lowered approximately 77.5 feet as a result of coal removal, and the postmining topography would lack some of the prominent ridges and rock outcrops that existed before mining.

Geology and Minerals

Impacts described for the Proposed Action and the No Action Alternative would constitute unavoidable adverse impacts on geology and minerals.

Geologic Hazards

There would be no unavoidable adverse impacts.

Water Resources

Groundwater

Coal and overburden aquifers would be permanently altered.

Surface Water

There would be an unavoidable increasing disturbance in watersheds within the proposed lease exchange area and surface water loss due to channel and diversion modifications and evaporation from settling ponds.

Wetlands

There would be a long-term and possibly permanent loss of wetlands and wetland functions and values; however, functional wetlands would be replaced on an acre-for-acre (or more) basis.

Alluvial Valley Floors

There would be no unavoidable adverse impacts to AVFs.

Soils

Unavoidable impacts to soils would include soil loss due to wind and water erosion and short- and long-term loss of productivity in some soils due to vegetation removal,

soil exposure and compaction, mixing or soil horizons, and temporary reduction or loss of biological activity.

Vegetation

Unavoidable adverse impacts would include vegetation removal from pits and transportation corridors, a reduction in diversity of plant communities, and conversion of shrublands to grasslands.

Threatened, Endangered, and Candidate Plant Species

There are no unavoidable adverse impacts.

Wildlife

Wildlife habitat on 840 acres would be destroyed in the short-term until successful reclamation was accomplished. Animals would be displaced to adjacent habitats where some would not survive. Smaller, less mobile species would be killed during mining. Some raptor nests could be disturbed and may have to be moved.

Cultural Resources

Cultural sites that are determined to be eligible for the NRHP and that cannot be avoided are destroyed by surface coal mining after data from those sites is recovered. Sites that are not eligible for the NRHP are lost.

Paleontological Resources

Some paleontological resources could be destroyed during mining.

Visual Resources

The visual resources in the proposed lease exchange area would be changed from the existing rangeland to a surface coal mine until successful reclamation was accomplished.

Noise

Noise in the area and vicinity would be increased in the short-term during mining.

Air Quality

Air pollutant emission would increase as a result of mining, but no violations of national air quality standards would occur.

Land Use

During mining, existing land uses would be usurped partially or completely by mine activities.

Socioeconomics

There would be no unavoidable adverse impacts to socioeconomics.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The major commitment of resources would be mining and consumption of 101 million tons of coal to be used for electrical power generation. Coal bed methane associated with this coal at the time it is mined would be irretrievably and irreversibly lost. It is estimated that between 1% and 2% of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 599 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.

Loss of life may conceivably occur from the mining operation and vehicular and train traffic. On the basis of strip-mine accident rates in Wyoming as determined by the Mine Safety and Health Administration, fatal accidents occur at the rate of 0.02 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 2.76 per 200,000 man-hours worked. This potential loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine site would be mitigated to the maximum extent possible. Accidental destruction of unknown archeological or paleontological values would be irreversible and irretrievable.

SHORT-TERM USE OF THE ENVIRONMENT VERSUS LONG-TERM PRODUCTIVITY

The Proposed Action would produce coal at the anticipated production level of 18 million tons per year for 5.5 years. The forage and associated grazing and wildlife habitat that the proposed lease exchange area provides would be lost during mining and before successful reclamation. During mining, there would be a loss of native vegetation on 840 acres with an accompanying disturbance of wildlife habitat and rangeland. However, it is estimated that the mine site would be returned to equivalent or better forage production capacity for domestic livestock within about 40 years after

initial disturbance. Long-term productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb antelope habitat, but the area would be suitable for antelope following successful reclamation. Reduced topographic diversity would make the area permanently less suitable for mule deer. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for about 50 years after the initiation of disturbance. Re-establishment of mature sagebrush habitat--which is crucial for antelope and sage grouse--could take even longer.

There would be a deterioration of the groundwater quality in the lease area because of mining; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. During mining, depth to groundwater would increase as much as 5 miles away from the pit in the coal aquifer. The water levels in the coal aquifer should return to premining levels about 70 to 100 years after mining has ended. There would be a temporary depletion of the quantity of groundwater when the pit intercepts the aquifer and the water is pumped out; however, there should be no permanent depletion after mining.

Mining operations and associated activities would degrade the visual resources of the area on a short-term basis. Following removal of surface facilities and completion of reclamation, the long-term impact on visual resources would be negligible.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance. These changes would primarily impact hunting in the lease area. Since reclamation would result in a wildlife habitat similar to that which presently exists, there should be no long-term adverse impacts on recreation.

The Proposed Action would extend the life of an existing mine for five years, thereby enhancing the long-term economy of the region.

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.

The proposed coal lease exchange is expected to be mined as part of the current Buckskin Mine. BLM assumes that production at that mine would continue at 18 million tons per year, with the proposed coal lease exchange extending the mine's life

about five years (until 2019). Under the No Action alternative, mine production would be about 18 million tons per year until 2014.

Commercial coal bed methane production in the Wyoming PRB started in 1989, west of the Eagle Butte Mine (map 1-2 in chapter 1). Since that time, the area of coal bed methane drilling and production west of the mines has been extended both south and north of the original area of production. In May 1999, BLM released the *Wyodak Coal Bed Methane Project Draft Environmental Impact Statement* (USDI, BLM 1999a). That document addressed cumulative impacts of past, present, and reasonable anticipated future actions in the Wyoming PRB (Campbell and Converse counties). The analysis looked at the coal surface mining activity, oil and gas produced from conventional reservoirs or fields, and gas produced from coal beds through groupings of CBM development wells. Uranium has been produced in the past from surface mines and currently is produced by *in situ* leaching at three locations in the PRB.

There are 15 surface coal mines in operation or capable of operation in Campbell and northern Converse counties, Wyoming. Due to mine sales, mine consolidations and mine inactivity, this number has not been static for several years. The mines evaluated in the studies done for the Wyodak CBM Project Draft EIS (USDI, BLM 1999a) and their 1998 production is listed in table 4-1. For the Wyodak CBM project analysis, reasonably foreseeable production rates at these coal mines were projected to 2015 using a factor derived by dividing the total demand predicted for 2015 (USDI, BLM 1999b, appendix C) by the total production level permitted by the WDEQ/AQD. The projected demand in 2015 is about 82% of the total currently permitted production level. The Wyodak CBM project predicted production levels for each mine in 2015 (using this factor) as shown in table 4-1. As indicated above, these production rates were estimated based on projected demand, however, individual mines may produce up to their permitted levels based on contracts and market conditions. For the Buckskin Mine, the predicted 2015 production of 20 million tons is greater than the 18 million tons per year assumed in the Proposed Action but less than the currently approved air quality permit level at the Buckskin Mine (22 million tons per year). As a result, the cumulative impact analysis for the Wyodak CBM project, which is summarized in this draft EA, may have overestimated cumulative impacts in the area of the proposed lease exchange tract.

The BLM analyzed activity levels, production statistics, and surface disturbance in 1995 from all mineral and energy development in the PRB to check previous forecasts and to ensure that the reasonably foreseeable development of coal, conventional oil and gas, and coal bed methane remains within the development scenarios used previously to analyze and predict the environmental effects of these activities. BLM's most recent compilation of statistics is summarized in the following two paragraphs (USDI, BLM 1996a, 1997).

TABLE 4-1
COAL PRODUCTION AND DISTURBANCE FOR MINES IN THE CUMULATIVE IMPACT STUDY AREA

Mine	1998 Coal Production (million tons)	Currently Permitted Production (million tons)	Reasonably Foreseeable Production Rates (2015) (million tons)	Cumulative Disturbance (1997-1998) (acres)	Cumulative Permanent Reclamation (1997-1998) (acres)
Antelope	19.4	30.0	25	2,749.50	336.60
Belle Ayr	22.5	25.0	37	4,496.00	1,285.10
Black Thunder	42.7	55.0	45	6,684.00	2,584.00
Buckskin	17.3	24.0	20	1,830.70	431.60
Caballo[1]	25.9	51.0	42	4,029.00	987.50
Clovis Point[2]	0.0	0.0	0	694.32	156.70
Coal Creek	7.1	18.0	15	1,461.00	192.00
Cordero-Rojo[3]	37.0	60.0	49	6,884.10	1,627.00
Dry Fork	1.0	15.0	0	967.68	108.82
Eagle Butte	18.1	35.0	29	2,395.00	560.50
Fort Union/KFx[4]	0.0	9.4	0	367.50	70.19
Jacobs Ranch	29.1	35.0	29	5,355.40	3,251.80
North Antelope/Rochelle	64.6	65.0	54	4,860.60	510.60
North Rochelle	<<.01	20.0	16	446.29	5.70
Rawhide	5.4	24.0	20	2,539.50	547.40
Wyodak	3.3	10.0	8	943.05	149.60
Total	**293.4[5]**	**476.4**	**389**	**46,848.94**	**12,805.11**

[1]The Caballo Mine includes the Caballo and former Rocky Butte leases. The Caballo Mine operator (Peabody) bought the Rocky Butte leases.
[2]Kennecott owns the Caballo Rojo and Cordero mines, which they refer to as the Cordero-Rojo Complex. Each mine is permitted separately.
[3]Clovis Point Mine has been shut down, the leases were sold to adjacent mines or relinquished, and the facilities were sold.
[4]KFx bough part of the Fort Union Mine and facilities to test a coal enhancement process.
[5]The 293 million tons of coal produced by mines in the PRB during 1998 represents about 93% of Wyoming's coal production for 1998.

SOURCE: USDI, BLM 1999a.

The cumulative surface disturbance from coal development and production from mines in Campbell and Converse counties were reported to the WDEQ in 1997 as 46,849 acres (table 4-1). Of this total acreage disturbed by coal mining, 12,805 acres were reported to the WDEQ as permanently reseeded. Coal mining disturbs about 2,000 acres annually. Coal reclamation bonds are held for a minimum of 10 years following permanent reseeding of disturbed areas. About 1,850 acres are reclaimed annually (USDI, BLM 1996a). Mining and reclamation rates are expected to increase through the year 2015; the balance between reclamation and mining should remain about the same. Uranium mining activity has disturbed approximately 4,400 acres. Sand, gravel, and scoria extraction operations have disturbed an estimated 1,200 acres (Barrett 1998).

In 1995 there were about 3,313 producing oil and gas wells (including an estimated 153 producing CBM wells) in Campbell and Converse counties. The cumulative surface disturbance resulting from producing conventional oil and gas wells and facilities is expected to remain relatively constant over the next 20 years, as the acreage from new producing wells remains approximately equal to the acreage reclaimed when wells are plugged and abandoned. In 1994 an estimate of three acres per well was used to project existing long-term disturbance for all facilities related to producing conventional oil and gas wells. At that time, an estimate of two acres per well was used to project long-term disturbance for all facilities related to productive CBM wells.

Cumulative, long-term disturbance from producing conventional oil and gas wells continues to affect about 1,200 acres, or about one-quarter to one-half acre per producing well. This realistic expression of disturbed areas that remain to be reclaimed includes only producing pads and facilities that will be reclaimed when production ends. The road system developed for oil and gas exploration within the PRB (which represents a large portion of the 1994 estimate of disturbed areas) has been in place for up to 20 to 30 years in many areas. It will remain to serve the area's transportation needs after oil and gas production ends.

CBM development occurring through the end of 1998 may affect up to 5,200 acres by the time all facilities required to support the 890 CBM wells already analyzed by BLM are in place. Long-term disturbance, until production from these 890 wells ends, would affect about 2,000 acres.

This analysis assumes an additional 3,000 new CBM wells after 1999, which may affect 16,751 acres. Long-term disturbance of these additional wells, until production ends, would affect an estimated 6,514 acres. Cumulatively, an estimated 22,000 acres may be disturbed by CBM development. About 8,500 acres would be affected by long-term disturbance (890 wells in place as of the end of 1998 and 3,000 new wells that would be drilled after 1999) until CBM production ends (expected to be within 20 years).

Conventional oil and gas production has decreased in Wyoming's PRB since 1981. In recent years, more wells have been plugged annually than have been drilled, although acres disturbed versus acres reclaimed have remained relatively constant. The exception to this trend is the current interest in developing shallow CBM resources just west of the coal mines.

In the PRB, the coal reserves currently leased represent a small percentage of the total coal reserves, but a large percentage of those shallow reserves that are the most economical to recover. Removing this coal is an irreversible and irretrievable impact. PRB coal was used to generate electricity for the public in 19 states and Canada in 1995. People in those states benefit from the low utility rates related to the price of coal, from the clean air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal. Locally, continued sale of PRB coal helps support and maintain stable municipal, county, and state economies.

In addition to the ongoing coal mining and leasing, and the CBM development, four other projects are in progress or planned in the vicinity of the southern mine group: 1) construction of the North Rochelle Mine facilities and rail loop (mostly complete at this time); 2) construction and operation of the ENCOAL facilities within the rail loop at the North Rochelle Mine; 3) construction and operation of the Two Elk Power Plant east of the Black Thunder Mine; and 4) construction and use of the proposed DM&E rail line. These projects are considered in this cumulative impact discussion because, due to their locations, the impacts from these projects could overlap with the impacts of coal mining and coal bed methane production. However, all of these projects are located more than 50 miles from the proposed lease exchange tract.

Topography and Geology

The PRB is characterized by relatively flat or rolling topography. Following surface coal mining and reclamation, topography would be modified in an elongated corridor east of and paralleling Wyoming Highway 59 from just north of Gillette, Wyoming, south for about 75 miles. Oil and gas (CBM) development would have little effect on topography.

After reclamation, these characteristics would be emphasized in the reclaimed area. Premining features that were more topographically unique (steeper hills, gullies, and rock outcrops) would be smoother. The reduction in topographic diversity may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges usually are very large, and mining activities usually are not located in crucial habitats. The overall flattening and lowering of the topography would result in increased infiltration of surface water and reduced peak flows from drainages within mined areas. The impact of these changes would be minimized by the orientation of drainage systems within the project area. Streams generally flow from west to east

across the area rather than from north to south along the entire corridor. Therefore, only a very small part of each stream's drainage area would be disturbed. Table 4-1 displays cumulative acres disturbed and acres reclaimed by the mines located within and adjacent to the proposed lease exchange area. Overall, the effects would not be noticeable or affect anything but drainages and natural drainage patterns.

Mineral and energy resources are nonrenewable. Although supplies of low-sulfur coal in the PRB are vast, these resources can be exhausted as a cumulative effect of continuing production.

Wyoming coal production increased from 94.0 million tons in 1980 to an estimated 314.9 million tons in 1998 according to Wyoming Department of Employment, Division of Mine Inspections and Safety (1999). Campbell and Converse counties produce 85% to 95% of Wyoming coal each year. Wyoming's growing coal production is mainly from elevated sales of inexpensive low-sulfur coal to electric utilities who must comply with requirements of the 1990 Clean Air Act amendments. These electric utilities account for most of Wyoming's coal sales. Increases in demand for electricity probably will result in a continuing demand for federal coal from Wyoming's PRB (USDI, BLM 1996a). Table 4-1 shows recent coal production in the PRB.

The BLM's status check report on coal development in the PRB (USDI, BLM 1996a) documented actual cumulative mineral development impacts from 1980 to 1995 and compared them with the cumulative mineral development impacts predicted in previous regional EISs. In Wyoming, the status check compared actual development in Campbell and Converse counties with the predictions in the Eastern Powder River Coal Final EIS (USDI, BLM 1979) and the Powder River Coal Final EIS (USDI, BLM 1981). A primary conclusion reached in the status check was that regional coal production levels are within predicted coal production levels, except for the southernmost group of mines, where production has exceeded predictions. The Wyoming status check also considered predictions that were made in *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin* (USGS 1988). The status check and recent updates are incorporated by reference into this analysis.

Oil production has been declining in Campbell and Converse counties, as well as in the rest of the state. Gas production in the two counties is now increasing as a result of increasing coal bed methane production. In 1995, oil production for Campbell and Converse Counties was 22,414,000 barrels, conventional gas production was 45,500,000 mcf (thousand cubic feet), and coal bed methane production was 4,700,000 mcf.

Other mineral development levels in Wyoming's PRB currently are less than predicted in the regional EISs. In the 1970s, significant uranium development was anticipated in southwestern Campbell County and northwestern Converse County. Extensive

development never occurred because of the reduced price of uranium since the early 1980s. However, there are three active *in situ* uranium operations in Converse and Johnson counties, but there are no active uranium mines or mills.

Scoria is quarried by coal mines, the counties, and a few construction firms for use as road surfacing material. Bentonite is mined in Johnson County.

Water Resources

Groundwater

The common, and potentially cumulative impacts to groundwater resources by activities associated with coal mining and CBM development include withdrawal of water from the coal seam resulting in a loss of head in the coal. In the case of CBM development, the produced water is discharged on the surface.

The WDEQ/LQD is required by the SMCRA and LQD rules and regulations (WDEQ 1998a) to assess the potential for cumulative hydrologic impacts of current and anticipated mining on the ground- and surface water systems each time a mine permit application or a mine permit revision is made.

In 1987, the USGS, in cooperation with the WDEQ/LQD and OSM, conducted a study of the hydrology of the eastern PRB. The purpose of the study was to provide the hydrologic information needed to perform these assessments. The resulting document, *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming* (CHIA), describes the cumulative effects of all current and anticipated mining (as of 1987) on the hydrologic system (USGS 1988). At the time, the 1988 CHIA was the most comprehensive basinwide assessment of the potential hydrologic impacts of surface coal mining in the Wyoming PRB. However, the CHIA did not address the impacts of CBM development, as this was not anticipated at the time.

As a result of a cooperative agreement signed in 1993, BLM, OSM, UW, and the WSEO provided assistance to WDEQ/LQD in updating the CHIA process. A pilot CHIA study was performed in the Little Thunder drainage basin (UW 1997). An assessment of groundwater impacts for CBM and coal development south of Gillette was performed under an extension of the 1993 agreement, but the results have not yet been published. Information from this work was used in compiling this EA where appropriate.

Existing Monitoring Programs. Each mine is required by the WDEQ/LQD to monitor groundwater levels in the coal itself as well as in shallower aquifers in the area surrounding their operations. There are also requirements for drilling monitoring wells in the backfill areas of the mines in order to record the water level recovery in these

areas. In addition to the mine monitoring required by WDEQ/LQD, the WDEQ, WSEO, Wyoming Oil and Gas Conservation Commission (WOGCC), and the BLM have required water monitoring to be done for different aspects of CBM projects.

The Gillette Area Groundwater Monitoring Organization (GAGMO) is a voluntary group formed in 1980. The purpose of GAGMO is to assemble and report the hydrologic monitoring data being collected by the coal mining companies operating in the eastern PRB, from the Buckskin Mine north of Gillette to the Antelope Mine in northern Converse County. Members of GAGMO include most of the companies with operating or proposed mines in that area, the WDEQ, the WSEO, the BLM, the USGS, and the OSM.

Each year GAGMO contracts with an independent firm to publish the results of the monitoring for that year. In 1996 GAGMO published two reports--an annual report for 1995 and a 15-year report. The 15-year report, prepared by Hydro-Engineering of Casper, summarized the data accumulated during the last 15 years of monitoring. According to that report, approximately 600 monitoring wells were operated at 20 operating or proposed coal mines in 1995 (Hydro-Engineering 1996).

A major groundwater issue is the extent of the loss in hydraulic head in the coal and shallower aquifers in the area surrounding the mines. Most of the monitoring wells included in the GAGMO 15-year report are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. Figure 4-1, taken from the GAGMO 15-year report, shows the area where actual decline in hydraulic head in the coal seam has been greater than five feet in 15 years, in comparison with the predicted worst-case 5-foot decline derived from groundwater modeling done by the mines (Hydro-Engineering 1996). WDEQ/LQD policy, which is required by state law, is to have the mining companies determine the maximum probable extent of the five-foot drawdown line through modeling.

In general, drawdown in the coal does not extend east of the coal mines because the mines are located on or near the coal outcrop line. The actual 15-year, five-foot groundwater drawdown contours have not exceeded worst-case development drawdown predictions for the mines north and east of Gillette (where the proposed lease exchange occurs) or for the mines east and southeast of Reno Junction. Drawdowns are reaching the predicted worst-case drawdown levels in the group of mines located between Gillette and Wright (figure 4-1). This is because there is an overlap of drawdown impacts from coal mining and CBM development. The projected worst-case drawdown lines shown in figure 4-1 are based on projected coal mining only.

Similarly, the actual five-foot drawdown levels are well within the cumulative drawdown levels predicted by the CHIA for the mines north and south of Gillette (USGS 1988). However, actual drawdown levels have reached the CHIA's predicted cumulative

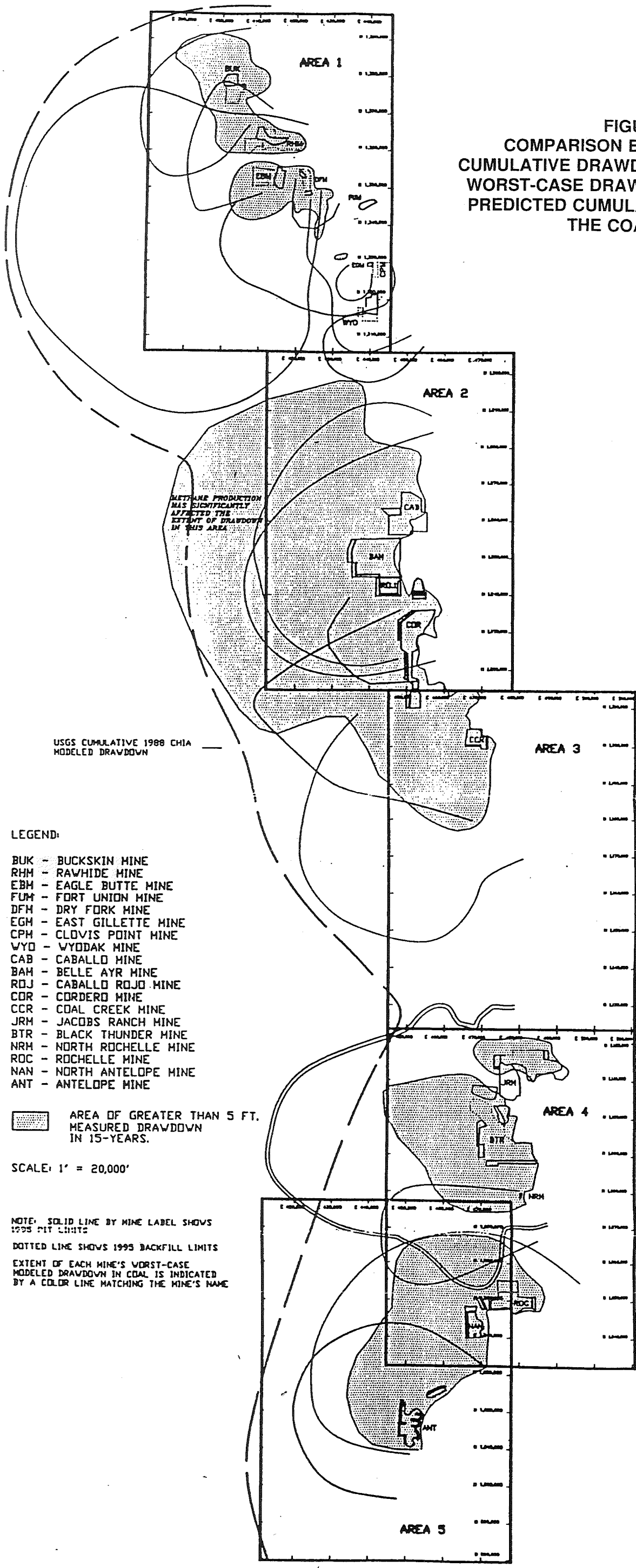


FIGURE 4-1
COMPARISON BETWEEN THE 1995 CUMULATIVE DRAWDOWNS AND THE MINES' WORST-CASE DRAWDOWN AND THE USGS PREDICTED CUMULATIVE DRAWDOWNS IN THE COAL AQUIFER

SOURCE: USDI, BLM 1999

drawdown level in the group of mines between Gillette and Wright because of overlapping CBM and coal mining impacts. The 1988 CHIA predicted the approximate area of five feet or more water level decline in the Wyodak coal aquifer that would result from "all anticipated coal mining." "All anticipated coal mining," as referred to in the 1988 CHIA, includes 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines were considered in the CHIA analysis (USGS 1988). CBM development was not anticipated at the time that analysis was prepared. The 1988 CHIA concluded that water supply wells completed in the coal may be affected as far away as 8 miles from mine pits as a result of the anticipated coal mining, but the effects at that distance were assumed to be minimal.

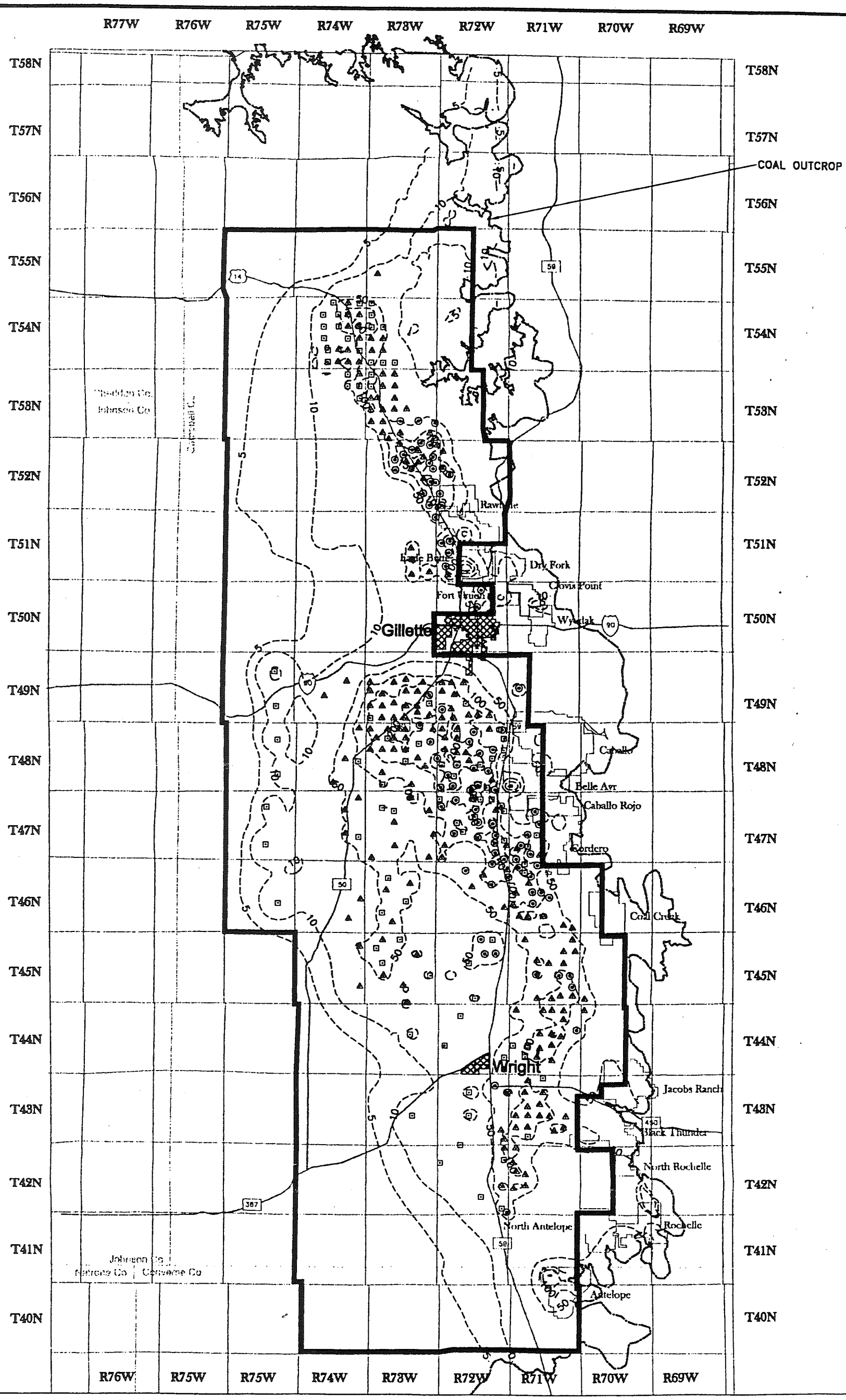
A groundwater flow model was developed for the Wyodak CBM project to predict the impacts of CBM and coal mining on the coal and shallower aquifers. The results of the Wyodak CBM groundwater impact modeling analysis were published in the Wyodak CBM Project Draft EIS (USDI, BLM 1999a) and revised in the final EIS (USDI, BLM 1999c). Technical reference documents describing how these analyses were done is available for technical review at the BLM Buffalo office (Applied Hydrology Associates, Inc. 1999). This modeling analysis covers a large area and the modeling is less detailed than the modeling that is done by individual mines for their WDEQ permits. The results of this cumulative modeling analysis for the year 2015, which is the anticipated maximum drawdown year for CBM operations, are shown in maps 4-1, 4-2, and 4-3. As a result of comments received on the draft EIS, additional modeling was redone and is included.

Surface Water

Surface water within the project area and watersheds downstream originate from precipitation, groundwater pumping, discharge from CBM wells, and from waters released from storage reservoirs.

The CHIA predicted that major streams in the PRB would exhibit increased runoff ranging from 0.4% in the Cheyenne River to 4.3% in Coal Creek due to cumulative disturbance as a result of existing and proposed surface coal mining (USGS 1988). CBM development was not considered in that analysis, but depending on the level of development, runoff could increase substantially in some of the area's streams. To date, water produced by CBM wells typically has been used for stock or other purposes by the surface landowners in the area of development.

The surface coal mines would have additional surface water to manage through their mines as a result of CBM development. The mines may have to resize culverts carrying water from upstream reaches of overlying watersheds and diversion channels for natural flows to handle additional base flows. Sedimentation ponds may have additional water to treat as a result of CBM discharge waters. As discussed



SOURCE: USDI, BLM 1999c.

Note: 1 Pod = 10 Wells

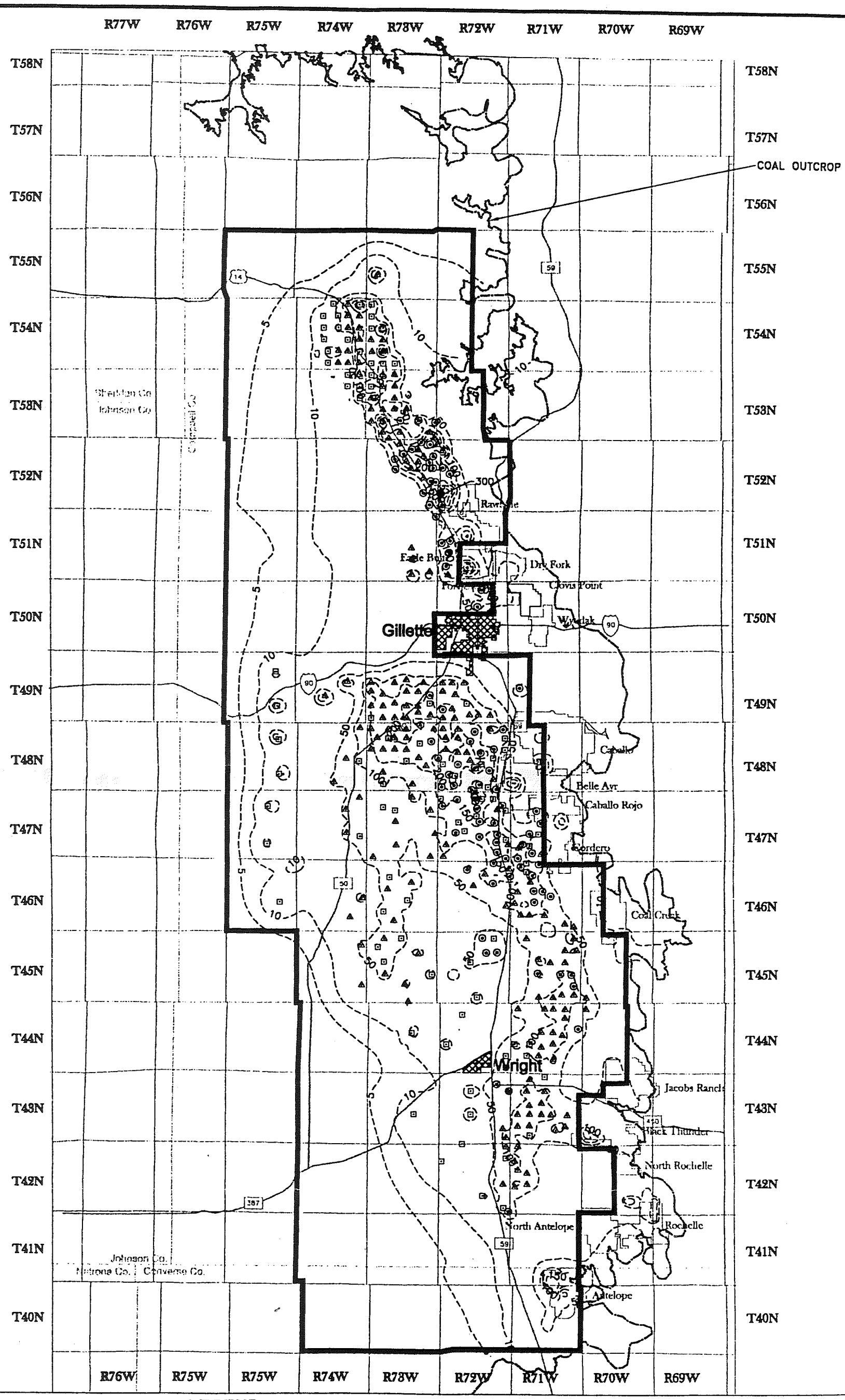
0 8.5 17

Scale (mi)

LEGEND

- Existing Well Pods
- Projected "No Action" Well Pods
- Projected "Proposed Action" Well Pods
- Wyodak CBM Project Area Boundary
- Coal Lease Boundary
- Population Area
- Drawdown Contour (ft)

MAP 4-1
MAXIMUM MODELED DRAWDOWN 1975-2008
UPPER WYODAK COAL



SOURCE: USDI, BLM 1999c.

Note: 1 Pod = 10 Wells

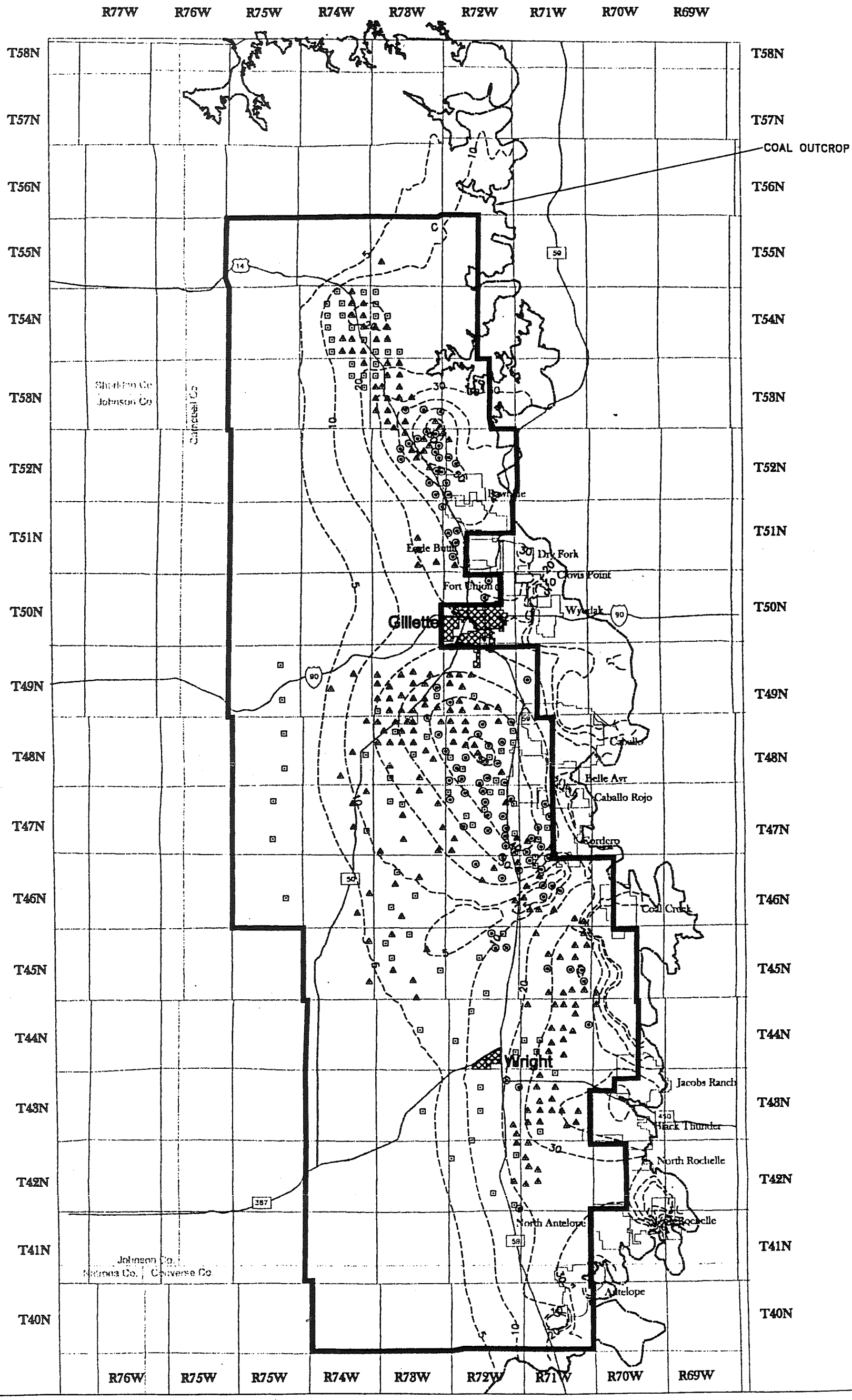
0 8.5 17

Scale (mi)

LEGEND

- Existing Well Pods
- Projected "No Action" Well Pods
- Projected "Proposed Action" Well Pods
- Wyodak CBM Project Area Boundary
- Coal Lease Boundary
- Population Area
- Drawdown Contour (ft)

MAP 4-2
MAXIMUM MODELED DRAWDOWN 1975-2008
LOWER WYODAK COAL



LEGEND

- Existing Well Pods
- Projected "No Action" Well Pods
- Projected "Proposed Action" Well Pods
- Wyodak CBM Project Area Boundary
- Coal Lease Boundary
- Population Area
- Drawdown Contour (ft)

SOURCE: USDI, BLM 1999c.

Note: 1 Pod = 10 Wells

0 8.5 17
Scale (mi)

MAP 4-3
MAXIMUM MODELED DRAWDOWN 1975-2015
WASATCH SAND

previously, both state and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards.

The water produced from CBM wells may also decrease the amount of dewatering that coal mines need to do before mining. The dewatering associated with coal mining was estimated by the USGS in 1990 to be 22.27 million gallons per day (USGS 1998). If CBM production decreases the dewatering at the mines to the extent that there is not enough to meet the water consumption needs for mining operations, mining companies may need to increase their withdrawals of surface or ground water. The mines' present use of surface water is estimated to be 6.22 million gallons per day.

In 1990, approximately 29.3 million gallons per day of surface water withdrawals provided irrigation to 6,830 acres in the Little Powder River, Belle Fourche, and Powder River drainages during a below average water year (USGS 1998). Flood irrigation occurred on 72% of the acreage. Not all withdrawals were consumed, and return flows were approximately 68% of irrigation withdrawal rates.

Less than 2% of irrigation waters in the proposed lease exchange area were obtained by groundwater withdrawals (USGS 1998). Groundwater withdrawals for irrigation waters may decrease with greater availability of surface water produced from CBM wells. Groundwater withdrawals of 0.61 million gallons per day for stock watering also may decrease with greater availability of CBM-generated surface waters.

A total of 2.2 million gallons per day are used for stock watering and is concentrated within the Little Powder, Belle Fourche, and the upper reach of the Powder rivers. Increases in stock watering would occur with the judicious impoundment of CBM-produced waters that are discharged in the headwaters of these drainages. Landowners may start running cattle or increase the size of their herds resulting in greater increases in stock watering within those drainages which currently have little or no livestock use.

Water produced from conventional oil and gas drilling is not discharged directly to surface waters. These waters are treated to meet effluent limitations and must be discharged under permit from WDEQ.

Some drainages within the area may be one to several feet deeper than they are today due to stream erosion. Careful selection of CBM discharge points and appropriate armoring of splash pads will prevent or mitigate this impact. Down valley, there may be a few more bar or beach deposits within perennial streams or rivers than at present. Springs that had been flowing regularly for over a decade or that have been developed, may incur reduced or irregular flows which approximate present conditions.

Reservoirs downstream of the mines and CBM development area will receive more water as a consequence of CBM development. Reservoirs that could be affected include Lake Sakakawea on the Missouri River, Keyhole State Reservoir on the Belle Fourche River, and Angostura Reservoir on the Cheyenne River. The ephemeral tributary to Hay Creek located in the proposed lease exchange area is part of the Missouri River drainage area.

Soils

Disturbance from mineral development projects such as coal, uranium, sand, gravel, and scoria mining, as well as oil and gas development, contribute to impacts to soil resources in Campbell and Converse counties. In 1994, estimated cumulative disturbance related to mineral development, including power plants and railroad lines, was more than 60,000 acres. These disturbances will continue as mineral resources are developed in the future. Before reclamation, the disturbed areas may not be available for current uses and may contribute to surface runoff and erosion problems. Once the disturbed areas are revegetated and reclamation is completed, the reclaimed areas would support the predisturbance land uses.

Vegetation

Disturbance from mineral development projects such as coal, uranium, sand, gravel, and scoria mining, as well as oil and gas development, also disturb the vegetation resources in Campbell and Converse counties. In 1994, estimated cumulative disturbance related to mineral development, including power plants and railroad lines, was more than 60,000 acres. These disturbances will continue as mineral resources are developed in the future. Before reclamation, the disturbed areas may not be available for current uses and may contribute to surface runoff and erosion problems. Once the disturbed areas are revegetated and reclamation is completed, the reclaimed areas would support the predisturbance land uses.

Vegetative manipulations associated with ranching operations have included removing or reducing grassland-shrubland plant communities and replacing them with cultivated crops or reducing shrubs (mainly big sagebrush) in favor of grass species. Reclamation of surface disturbance related to coal mining, oil and gas development, and CBM development also has reduced shrub density. Shrubs are relatively unproductive for livestock but are very important for wildlife, especially in big game winter ranges. Following reclamation and release of the reclamation bond, privately owned surface lands would be returned to agricultural management. The areas with reestablished native vegetation could again be cultivated or used however the landowner wished.

Potential long-term cumulative impacts from coal and other mining activities, oil and gas development, and CBM development include reduced plant species diversity,

particularly big sagebrush, on some reclaimed lands. Reclaimed areas would be dominated initially by grassland vegetation that is less diverse than undisturbed areas. Within about 10 years following reclamation, a diverse, productive, and permanent vegetative cover would be re-established on disturbed areas. Reclaimed vegetative communities may never completely match the surrounding native plant community in species composition or diversity. Site productivity for grasses and forbs would return to existing levels with timely and well planned reclamation, but productivity for shrub and tree (woody) species would likely be lower for many years following reclamation. The ecosystem functions served by the existing vegetative community may not be served as well, or at all, by the reclaimed vegetative community, especially initially, when the density of woody species would be most reduced.

Threatened, Endangered, and Candidate Plant Species

No federally listed TE&C plant species are known to occur within the EA area or within a one township buffer around it (Wyoming Natural Diversity Database [WNDD] 1999).

Two species, rare to Wyoming, have occurred in the vicinity of the EA area: 1) short-point flatsedge (*Cyperus acuminatus*); and 2) the small-flowered flame flower (*Talinum parviflorum*). These species are common elsewhere but reach the edge of their range in Wyoming; therefore, both species are ranked S1 (quite rare in Wyoming) but are globally secure under present conditions, and they do not have any federal status.

Wildlife

Big Game

Cumulative impacts to most wildlife species would increase as additional habitat is disturbed but would average out as more land is reclaimed. Big game would be subject to the greatest cumulative effects. If the proposed lease exchange area were mined, until reclamation replaces disturbed acreage, portions of winter, winter/yearlong, severe winter, and yearlong range for antelope, mule deer, white-tailed deer, and elk may be removed. Coal mining, CBM development, other mining activities, and conventional oil and gas development already have impacted some of this range. Additional disturbance from construction and maintenance of roads, pipelines, pods, compressor stations, and reservoirs, as well as increased human use of the area could cause additional stress to big game populations. In many cases, big game populations can habituate to human activity, so this effect may be short-term. After development and reclamation are finished, most disturbed areas would be available for big game.

Following reclamation of surface disturbance related to coal mining, other mining activities, oil and gas development, and CBM development, shrub density on reclaimed areas would be reduced. The cumulative reduction in the important shrub

component critical for winter range may reduce the winter survival of big game and sage grouse. The spring and summer habitat for grazing species that depend on grassland plant communities would benefit from increased grass cover.

The ecosystem functions served by the existing vegetative community may not be served as well, or at all, by the reclaimed vegetative community, especially initially when the density of woody species would be most reduced. Reclaimed wetland communities having fewer woody species would not continue to function as bird sanctuaries and would attract fewer raptors or songbirds. Reclaimed grasslands with a reduced shrub component would not continue to function well as nesting sites for some bird species. These areas also would not provide the nutritious forage for big game species that is needed for well functioning winter range.

Upland Game Birds

Raptor and grouse breeding areas have been diminishing statewide for at least the last 30 years, partially from surface-disturbing activities. Coal mining and gas exploration and development may have also contributed to this decline in breeding habitats. The reduction in sagebrush and fragmentation of habitat has been presumed to be the cause of the downward trend in sage grouse populations.

Yearlong prohibitions on surface occupancy and restrictions on disturbance or use in order to protect crucial sage grouse areas have not been applied successfully in the PRB. However, seasonal restrictions on activities have been applied to oil and gas operations occurring within or near crucial areas.

Potential cumulative effects on raptors include the loss of foraging habitat for some species. Other species may benefit from habitat alterations that result in higher densities of preferred prey. Some raptors may experience increased mortality from collisions with electric lines while flying during times of poor visibility or while pursuing prey, engaging in courtship flights, or defending territory. Other effects could include mortality from electrocution or indiscriminate shooting in areas with increased accessibility. The addition of transmission poles during reclamation may replace raptor perching sites that are lost.

Cumulative surface disturbance of habitat from mining, CBM production, and oil and gas development is not expected to directly affect sage grouse populations. Because of the split mineral estate that exists in the PRB, yearlong prohibitions on surface occupancy and restriction of activities near grouse crucial areas have proven unsuccessful.

Indirect impacts also occur. Noise related to mining and oil and gas drilling and production activities could indirectly affect sage grouse reproductive success. Sage grouse leks close to active development could be abandoned if noise associated with

activities elevates 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. Over time, this can alter the distribution of breeding grouse (Remington and Braun 1991).

Sage grouse populations throughout Wyoming have been declining over the past several years. Thus, indirect noise impacts could be significant to local populations, when evaluated with the cumulative impacts of all mineral and energy-related development occurring in the area. The BLM previously has identified a 2-mile buffer around each of the leks to address the impacts on sage grouse populations. Within these buffer zones surface disturbance has been restricted between March 1 through June 15 and permanent surface facilities have been prohibited within ¼ mile of a known lek. As mentioned previously, surface and timing stipulations are unsuccessful in protecting sage grouse habitat due to split estate mineral ownership. Access to monitor stipulations is restricted or not available due to private surface in most cases. After mining and reclamation, changes in the topography and vegetative cover particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the tract. Sagebrush would gradually reestablish on the reclaimed land, but the topographic changes would be permanent.

Numerous grazing management projects (fencing, reservoir development, spring development, well construction, vegetative treatments) also have impacted wildlife habitats 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 severely restricted antelope movement. Water developments are used by wildlife; however, without proper livestock management, many of these areas can become over grazed. Developed reservoirs provide waterfowl, fish, and amphibian habitat.

Habitat disturbance and reclamation, creating barriers to movement, increased human presence, and mortality from increased poaching and vehicle collisions involving pronghorn would produce cumulative impacts to pronghorn populations within the area. These impacts result from the combined effects of coal and other mining activities, conventional oil and gas development, and CBM development.

The cumulative disturbance related to existing and proposed mineral development could cause a reduction in habitat for small mammal and bird species. Many of these species are highly mobile, have access to adjacent habitats, and possess a high reproductive potential. Thus, these species are expected to adapt quickly to changing conditions and to invade suitable reclaimed lands.

Fish

Cumulative impacts on fish habitat and populations are expected to be minimal. Local

drainages have limited value due to intermittent or ephemeral flows. Some of the permanent pools along drainages support minnows and other nongame fish. Larger impoundments and streams in the area have fish populations.

Threatened, Endangered, Candidate, and Sensitive Animal Species

A biological assessment prepared for the eastern PRB concluded that coal mining operations might affect bald eagles. Following requirements of the Endangered Species Act, a biological opinion from the FWS was expanded to include a commentary on black-footed ferrets and peregrine falcons (USDI, FWS 1983). The opinion stated that cumulative impacts would not be adverse for bald eagles or peregrine falcons but might be adverse for ferrets. As a result, BLM requires ferret surveys within one year of surface disturbance, either as a commitment in the mine plan or as an oil and gas permit stipulation. Ferret surveys also are required by the BLM if wells are to be located in or directly adjacent to prairie dog towns.

FWS requirements also mandate surveys for mountain plovers in potential habitat before any surface-disturbing activities begin. The swift fox is another candidate species that has potential habitat in the PRB. This species has not been recently recorded in the area and should not be impacted. Any potential impacts to special status species, including threatened and endangered species and FWS sensitive species, are expected to be mitigated if these environmental protection measures are followed. No significant cumulative impacts to special status species, including threatened and endangered species and FWS sensitive species, are anticipated.

Habitat for T&E species is unavailable until reclamation is complete. Reclamation times vary with the type of development activity, but it generally begins as soon as mining or production is completed. If there are significant delays between habitat disruption and successful reclamation, the cumulative impacts to a T&E species may be intensified.

Cultural Resources

In most cases, treatment of significant sites is confined to those that would be directly impacted, while those that may be indirectly impacted receive little or no consideration unless a direct energy development effect can be established. Increased population levels associated with energy development coupled with increased access to remote areas are known to result in increased inadvertent damage to cultural resources and an increase in vandalism.

A majority of the known cultural resource sites in the PRB have been recorded as a result of studies at existing and proposed energy development sites where the oil and gas estate is federally owned. An average density estimate of 8.5 sites per square mile (640 acres) can be made based on existing inventories, and about 10% of these

sites are eligible for the NRHP. Unlike strip mining activities, many of the sites identified during surveys for oil and gas and CBM activities can be avoided. A number of significant sites, or sites eligible for nomination to the National Register, have been or will be impacted by energy development in the PRB. Ground disturbance, the major impact, can affect the integrity of a site or destroy it. Changes in setting or context also may impact historical properties. Mitigating measures such as stabilizing, restoring, or moving buildings may cause adverse impacts to context, in-place values, and overall integrity. Loss of sites through data recovery as a mitigation measure can constitute an adverse impact by eliminating the site from the regional database and affecting its future research potential.

Beneficial results can also be expected from energy development. Valuable data that would otherwise be lost are collected during cultural resource surveys and data recovery.

No cumulative impacts to Native American traditional values or religious sites are expected to occur.

Paleontological Resources

Impacts to paleontological resources as a result of already approved cumulative energy development occurring 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 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.

Visual Resources

A principal visual impact in this area is the visibility of coal mine pits and facility areas. However, anyone likely to see these facilities would either be passing through the area or visiting on related business. After mining, the reclaimed slopes might appear somewhat smoother than premining slopes, and there would be fewer gullies than at present. Even so, the landscape of the reclaimed mines would look very much like undisturbed landscape in the area. Except from the air, energy development activities are not visible from more than a few miles away.

Noise

The cumulative effects of noise levels are not expected to be noticeable to residents or visitors within the area.

Air Quality

A regional cumulative impact analysis was performed to estimate impacts on air quality in the year 2015 from the proposed action and all other reasonably foreseeable actions. This analysis consisted of an update and modification to the May 1999 Wyodak CBM Project DEIS far-range cumulative air quality analysis. No separate analysis was carried out to determine impacts of the Belco action alone. If the proposed lease exchange tract is mined as a maintenance tract, the changes in air emissions would be a small change in the location of Buckskin Mine emissions and an extension of mining activity at the Buckskin Mine. Therefore there would be negligible change in long-term cumulative air impacts specific to the Belco exchange.

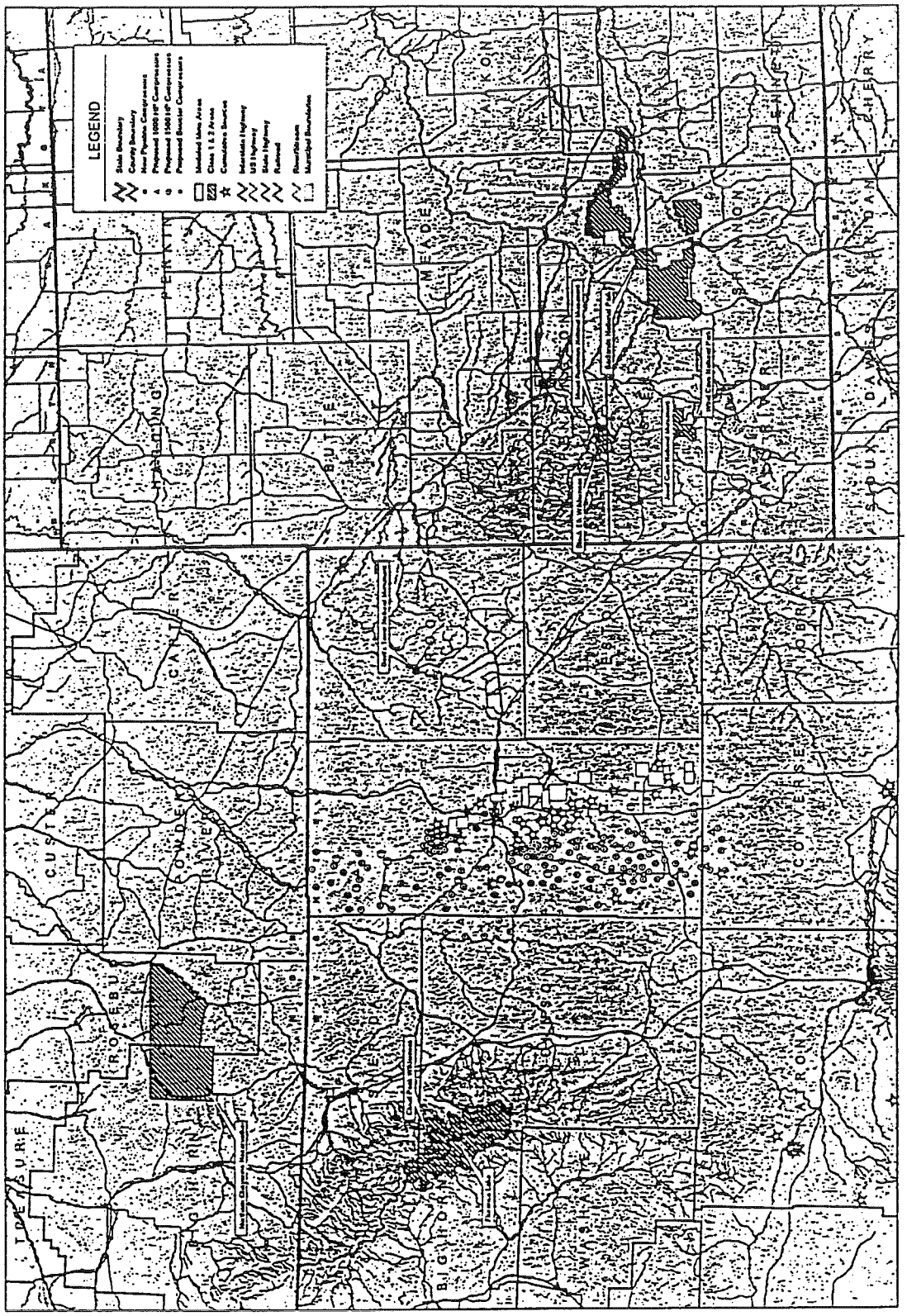
The regional (far-range) cumulative air quality analysis was carried out using the CALMET/CALPUFF model. Modeling was performed to estimate impacts of nitrogen oxides (NO_x), sulfur dioxide (SO_2) and particulate matter emissions on air quality, regional haze, and air quality related values (AQRVs) at Class I and sensitive Class II areas within approximately 150 miles (240 km) of Gillette, Wyoming. The area included in the model analysis is shown in map 4-4. The model analysis results presented in this section represent an indication of potential impacts based on currently available modeling technology and anticipated levels of activity in 2015 (see discussion section below).

Cumulative Emissions Inventory

An inventory of incremental air pollutant emissions was prepared using 1995 as the base year and 2015 as the analysis year. The inventory used data assembled for the Wyodak CBM Project cumulative analysis, but included a number of updates and revisions to incorporate newly available information (see discussion section below). The inventory included a breakdown of particulate matter emissions into three sub-groups: elemental carbon particle (EC), organic carbon particles (OC), and other undifferentiated particles, including fugitive dust (PM_{10}). The carbon particles, which are emitted primarily from diesel engines (mine equipment and trains) were treated separately because of their potential impact on regional haze. Sulfur dioxide emissions from blasting, trains and other diesel engines were also included, again because of potential regional haze impacts.

The four groups of air emission sources that were inventoried and the sources of emissions data relied upon follow.

1. ***All stationary point sources that began operation after 1995 and/or are permitted and reasonably expected to be operating after 1995.*** All permitted point source information was based upon state agency files, as obtained for the Wyodak CBM Project DEIS.



MAP 4-4
CUMULATIVE AIR QUALITY DOMAIN

2. ***Potential incremental increase in surface coal mining emissions.*** Coal production in the year 2015 was taken from projections by Resource Data International. The projected 2015 production level of 387 million tons per year compares to actual 1997 production at South Powder River Basin mines of 258 million tons, and to total permitted production for the same mines of 472 million tons per year. The permitted production is the regulatory limit based on present air quality permits. Thus, the reasonably foreseeable 2015 coal production assumed for the analysis represents 82% of maximum permitted production.

   Incremental coal production from 1995 to 2015 was calculated for each of the 15 PRB mines by assuming 82% of permitted production in 2015. Emission increases for each pollutant were estimated based on the ratio of emissions to coal production as shown by the most recent air quality evaluation for each mine, or for a similar mine if recent data were unavailable. Planned major changes in mine plans (i.e., use of conveyors to replace haul trucks) were taken into account where applicable.

   NO_x is produced at mines by blasting, diesel equipment, and on-site locomotives. The expected decrease in NO_x emissions from diesel equipment engines due to new federal emission standards was taken into account in estimating 2015 incremental emissions.

   SO_2 emissions originate from blasting, diesel equipment, and locomotives at each mine. Incremental emissions were calculated from projected increases in fuel use, based on data in recent mine analyses for fuel use per unit of coal production.

   Particulate matter is generated at mines as fugitive dust (PM_{10}), and as engine emissions (a combination of PM_{10}, EC, and OC). Fugitive PM_{10} emissions per unit of coal production were calculated from recent data for each mine and used to estimate incremental emissions for 2015 production. Incremental emissions of PM_{10}, EC, and OC from engines were calculated from projected fuel use, using the proportions of each particulate component in diesel exhaust as given by EPA's source composition library.

3. ***Coal transportation locomotive emissions.*** Emissions of NO_x, SO_2, and particulate matter (EC, OC, and PM_{10}) from coal train operations were calculated using EPA emission factors, locomotive fuel use, and the reasonably expected coal production for 2015. The proposed DM&E Railroad line was included in the analysis, using a potential route and number of trains suggested by DM&E. Fuel use and the fraction of total traffic on each of the existing Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) rail routes were provided by the railroads. Emissions assumptions and calculations were provided to BNSF, UP, and DM&E representatives for review prior to use for modeling. EPA's Tier I and Tier II emission standards for new and rebuilt locomotives were taken into account in

calculating year 2015 emissions by use of EPA's projected fleet average emission factors for that year.

4. ***Wyodak coal bed methane sources.*** Emissions for the CBM development will originate from compressor engines (NO_x), vehicle tailpipe emissions (NO_x), road dust from vehicle traffic (PM_{10}), and fugitive dust from disturbed areas (PM_{10}). Total emissions from all of these sources were taken from the CBM DEIS analysis.

Total emissions from all sources and operations are shown in table 4-2. These emissions were modeled as point and area sources, as appropriate, using the CALMET/CALPUFF modeling system, to estimate air quality impacts at the Class I and sensitive Class II areas shown on map 4-4.

Cumulative Air Quality Impacts

Based on the emission increase inventories for all regional sources, maximum 3-hour, 24-hour, and annual SO_2 impacts, 24-hour and annual PM_{10} impacts, and annual NO_2 impacts were modeled and compared to the Prevention of Significant Deterioration (PSD) Class I increments at the Class I areas, and to the National Ambient Air Quality Standards (NAAQS) at each sensitive Class II area. It is important to note that this is not a formal PSD increment analysis, and the references to PSD increments and NAAQS are intended only as a basis for comparison. The comparison does not constitute an air quality regulatory determination. Air quality standards are most stringent at Class I areas (National parks and large designated wildernesses) to afford the most protection for these pristine areas. The results of the air quality analysis for each area are provided in table 4-3. That table demonstrates that maximum projected cumulative impacts are much smaller than regulatory standards and increments.

Regional Haze Impacts

Regional haze impacts were calculated based on cumulative emissions impacts (modeled concentrations of nitrate, sulfate, carbon, and other particulate matter) within the CALPUFF modeling domain. Extinction coefficients were computed and their effect on visibility assessed by comparison to background extinction coefficients corresponding to the mean of the cleanest 20% IMPROVE visibility data from Badlands National Park and the Bridger Wilderness. Seasonal average relative humidity values were used for the comparison.

Results of the regional haze analysis are shown in table 4-4. Potential visibility reductions greater than the threshold values of 0.5 and 1.0 deciviews are indicated for all Class I and sensitive Class II areas. The number of days with an indicated potential change of one deciview or more ranges from four days in the Cloud Peak Wilderness to 70 days in Badlands National Park. It should be recognized that the analysis results reflect potential impacts at any one or more receptors in each area

(not at all receptors), and that the indicated change is relative to the 20% of best visibility days in each area. On many of the days for which model-predicted impacts occur, natural atmospheric conditions and/or background air quality levels would result in lower background visibility. Thus, actual visibility impacts would be less than indicated by the model results.

TABLE 4-2
CUMULATIVE POLLUTANT EMISSIONS
FOR FAR-RANGE AIR QUALITY/AQRV ANALYSIS

Source	Emissions after 1995 (tons/year)					Percent of Total				
	NO_x	SO_2	EC	OC	PM_{10}	NO_x	SO_2	EC	OC	PM_{10}
Wyodak CBM Sources										
Proposed compressors	2,806					13.6	0.0	0.0	0.0	0.0
Road dust from vehicle traffic					11,224	0.0	0.0	0.0	0.0	62.5
Fugitive dust from disturbed areas					956	0.0	0.0	0.0	0.0	5.3
Project vehicle exhaust	18					0.1	0.0	0.0	0.0	0.0
Other Sources										
Other point sources	7,662	5,032			917	37.2	76.2	0.0	0.0	5.1
Coal mines incremental increase (NO_x from blasting, trains, vehicles)	2,860					13.9	0.0	0.0	0.0	0.0
Coal mines incremental increase of fugitive dust					4,703	0.0	0.0	0.0	0.0	26.2
Coal mines incremental increase from mining vehicles		679	187	71	83	0.0	10.3	54.2	53.8	0.5
Coal trains incremental increase	7,262	888	158	61	70	35.2	13.5	45.8	46.2	0.4
Total	20,608	6,599	345	132	17,953	100	100	100	100	100

TABLE 4-3
RESULTS OF AIR QUALITY IMPACT ANALYSIS ($\mu g/m^3$)

Area	Annual NO_2	24-hr PM_{10}	Annual PM_{10}	3-hr SO_2	24-hr SO_2	Annual SO_2
CUMULATIVE IMPACTS						
Northern Cheyenne Reservation, MT	0.03	0.58	0.02	1.60	0.56	0.01
Badlands National Park, SD	1.25	0.65	0.10	3.61	1.20	0.21
Wind Cave National Park, SD	0.15	0.62	0.06	2.17	0.84	0.08
Class I PSD Increment	**2.5**	**4**	**8**	**25**	**5**	**2**
Black Elk Wilderness, SD	0.09	1.04	0.05	2.48	0.79	0.07
Jewel Cave National Monument, SD	0.13	0.76	0.08	3.92	0.87	0.09
Mt. Rushmore National Monument, SD	0.08	1.01	0.05	1.93	0.55	0.06
Cloud Peak Wilderness, WY	0.01	0.90	0.04	1.08	0.32	0.01
Devils Tower National Monument, WY	0.12	0.80	0.16	2.84	0.50	0.06
National Ambient Air Quality Standard	**100**	**150**	**50**	**1300**	**365**	**80**

TABLE 4-4
PREDICTED ANNUAL DAYS OF VISIBILITY REDUCTIONS AT CLASS I AND CLASS II SENSITIVE AREAS FROM CUMULATIVE SOURCES

Location	Type of Area	Number of Days Deciview Change >0.5	Number of Days Deciview Change >1.0
Northern Cheyenne Reservation	Class I	18	8
Badlands National Park	Class I	173	70
Wind Cave National Park	Class I	94	45
Black Elk Wilderness	Class II	66	28
Jewel Cave, NM	Class II	72	32
Mt. Rushmore, NM	Class II	58	22
Cloud Peak Wilderness	Class II	15	4
Devils Tower National Monument	Class II	70	28

Note: The Northern Cheyenne Reservation is a redesignated Class I area and is not addressed by existing visibility regulations which apply to the federally mandated Badlands and Wind Cave Class I areas.

The model predicts that Badlands National Park would experience the most significant visible impacts in 2015. The indicated impacts in Badlands National Park are strongly influenced by the close proximity of the modeled DM&E rail route. The modeled route is only one of a number of potential routes, and may not be representative of the actual route to be selected, nor is the modeled number of daily trains necessarily realistic of 2015 DM&E traffic. The Badlands results in table 4-4 reflect data for those areas of the park more than 20 km (12 miles) from the modeled rail route. The CALPUFF modeling system in the version applied in the present analysis is not appropriate for definition of impacts at short distances from linear sources such as railroads.

AQRV Impact (Acid Deposition)

In addition to evaluating potential impacts to visibility in Class I and sensitive Class II areas, an assessment of potential impacts to other AQRVs in these areas was performed. The AQRVs of concern for the Class I and sensitive Class II areas include soil, water, flora, and fauna. For impacts to AQRVs, other than visibility, acid deposition of nitrates and sulfates is of primary interest due to its effects on lake acidification, as well as possibly affecting flora and fauna.

The cumulative acid deposition analysis evaluated potential impacts to AQRVs by computing the amount of nitrogen and sulfur that would be deposited on land masses within the Class I and II areas. Additionally, the potential effects of acid deposition on Florence Lake (a sensitive lake located within Cloud Peak Wilderness, Wyoming) were also evaluated at the request of the FS. Nitrogen would originate from wet and dry deposition of nitrates and nitric acid, as well as dry deposition of NO_x. Sulfur would originate from wet and dry deposition of sulfates and SO_2.

To evaluate potential impacts to AQRVs, the wet and dry deposition of the nitrogen and sulfur- containing chemicals were computed using the CALPUFF model. Annual fluxes (mass per unit area) calculated for the Class I and sensitive Class II areas were compared to the limits of acceptable change (2.7 to 4.5 lb/acre/year) for evaluating effects on soil, flora, and fauna. The acid deposition calculations used in this analysis followed the procedures outlined in the IWAQM Phase 2 Report (USEPA, 1998) and FS guidance.

To evaluate the impacts to aquatic systems (Florence Lake) from acid deposition, the loss of Acidification Neutralization Capacity (ANC), in micro-equivalents per liter (μeq/l), was computed using FS methods (USFS, 1987). Since the baseline ANC at Florence Lake is 37.6 μeq/l (USDA FS, 1999), the limit of acceptable change in the ANC is 10 percent.

The results of the AQRV analysis for effects from acid deposition are summarized in table 4-5. The maximum annual deposition fluxes of nitrogen and sulfur due to

cumulative emissions are shown for each Class I and II area. As the data show, the highest nitrogen deposition would be 0.21 lb/acre/year, a value that is only 8% of the lower limit of acceptable change.

TABLE 4-5
PREDICTED LEVELS OF ACID DEPOSITION FROM CUMULATIVE SOURCES
(lb/acre/year)

Area	Significance Level	Total Nitrogen Deposition	Total Sulfur Deposition
Northern Cheyenne Reservation	2.7 - 4.5	0.060	0.010
Badlands National Park	2.7 - 4.5	0.212	0.067
Wind Cave National Park	2.7 - 4.5	0.059	0.054
Black Elk Wilderness	2.7 - 4.5	0.042	0.053
Jewel Cave National Monument	2.7 - 4.5	0.046	0.068
Mt. Rushmore National Monument	2.7 - 4.5	0.027	0.045
Cloud Peak Wilderness	2.7 - 4.5	0.004	0.006
Devils Tower National Monument	2.7 - 4.5	0.039	0.049

The ANC calculation for Florence Lake showed that the expected change in ANC due to cumulative acid deposition impacts would be 0.07%, a value much lower than the limit of acceptable change (10%).

Discussion

The cumulative air quality impact analysis presented here indicates that impacts in Class I and sensitive Class II areas, based on reasonably expected pollutant emission increases through the year 2015, would be quite small with the exception of impacts on regional haze. The model results suggest that haze impacts may exceed Limits of Acceptable Change (LACs) on some days in all areas evaluated. It should be noted that the LACs for visibility impacts, as well as those for other AQRVs, are not regulatory limits, but represent federal land manager policies for evaluating impacts.

The model-predicted numbers of days of regional haze impacts should be interpreted only as an indication of possible impacts. There are many uncertainties involved in air quality model projections, particularly for long-range transport modeling over large areas with widely varying terrain and land surface characteristics. The CALPUFF modeling system is relatively new and its calculation algorithms and methods of application are still evolving. Results are subject to wide variability with the quality and quantity of input meteorological data, the accuracy of emission estimates, the form of representation of different types of sources, chemical reaction and particle size assumptions, and other factors.

Some of the comments received on the CALPUFF cumulative analysis for the Wyodak CBM Project DEIS were considered and addressed in the present analysis, primarily through:

--- updated evaluation of railroad and coal mine emissions;

--- addition of the DM&E railroad;

--- distribution of future coal train traffic based on current distribution and DM&E projections;

--- addition of carbon particles as specific components of PM_{10};

--- addition of SO_2 emissions from diesel engines; and,

--- simulation of coal train emissions by area sources rather than volume sources.

There are additional refinements and/or improvements in model application that would lead to a better definition of potential future impacts. These include utilization of recent model refinements, incorporation of more sources of regional meteorological data, further refinement of emission estimates, and a better characterization of source parameters and geometries. In addition, further research is needed into the accuracy and appropriate interpretation of model results for regional haze. These improvements were beyond the scope of the present analysis, but should be addressed in future regional impact analyses.

It should be noted that model-predicted impacts, especially in Badlands National Park, are affected by proximity to the modeled route of the DM&E railroad. The DM&E possible route and traffic volumes were provided as examples of a possible future scenario, but are not yet determined. The model parameters utilized for DM&E are not necessarily indicative of what could actually be implemented. Thus, predicted impacts in Badlands NP and other sensitive areas proximate to the DM&E route are especially subject to future refinement. The CALPUFF model is a long-range transport model, and is not necessarily the best methodology for evaluating impacts at short distances (0 to 50 km). Since all of the Badlands receptors were within this distance from the hypothetical DM&E route, a more appropriate and detailed model approach would be in order if the eventual rail route passes near sensitive areas.

Land Use

The character of lands reclaimed following coal mining, conventional oil and gas development, and CBM development may be altered permanently. Effects on coal-mined lands include flattened topography, increased surface drainage, increased infiltration rates, reduced diversity of vegetative cover, and reduced sagebrush density.

The reclaimed area for one mine may affect several thousand acres concentrated in a few sites within several square miles. The character of lands reclaimed following conventional oil and gas development also may be permanently altered as described above, to a lesser degree than coal-mined lands, with little topographic flattening. The reclaimed areas for one producing field may affect a number of small sites concentrated within 5 to 20 square miles. The character of lands reclaimed following CBM development also may be altered slightly as described above. The changes typically would be less noticeable than those related to conventional oil and gas development but would affect a large number of very small sites dispersed over a very large area.

Most sites disturbed during coal mining or conventional oil and gas development undergo significant surface disturbance using cut and fill construction techniques and require recontouring and revegetation when operations conclude. CBM development generally requires less cut and fill as wells are shallow.

The decreased plant diversity would not have a serious effect on productivity of the reclaimed areas. Post-development land uses (rangeland, cropland, wildlife habitat, and mining/oil and gas development) would be achieved even with the changes in land character, vegetative species composition and diversity that are anticipated.

No cumulative effects on land use within the project area are anticipated.

New or enhanced transportation facilities (roads, railroads, and pipelines) are expected to occur as a result of the energy development in the assessment area. The extent of these changes cannot be described site-specifically at this time; these depend on the extent of increased production of oil, gas, water, and coal.

The cumulative effect of the development of roads and well facilities would be improved vehicular access to the area. However, a majority of this access would not

be available to the public since much of the surface is privately owned, and there are no recreation facilities.

Cumulative impacts from the increased human presence associated with the cumulative energy development in the PRB are likely to cause increased levels of legal and illegal hunting. Conversely, the mines in the area have become refuges for big game animals during hunting seasons since most are closed to hunting. Energy development-related secondary impacts to wildlife have and would continue to result from human population growth. Energy development has been the primary cause of human influx into the eastern PRB. The demand for outdoor recreational activities, including hunting and fishing, have increased proportionately. However, at the same time these demands are increasing, wildlife habitat and populations are being affected by increased surface disturbance.

Demand for hunting licenses may increase to the point that a lower success in drawing particular licenses would occur; hunting and fishing may become less enjoyable due to more limited success and overcrowding; poaching may increase; the increase in people and traffic has and may continue to result in shooting of nongame species and road kills; and increased off-road activities have and would continue to result in disturbance of wildlife during sensitive wintering or reproductive periods. Travel management during hunting season, including seasonal road closures to the public, could disperse hunters throughout the area, reduce hunting pressure in popular areas, and facilitate a more enjoyable experience for hunters.

Socioeconomics

Cumulative socioeconomic impacts are a major concern because considerable energy-related development has occurred in and around Campbell County during the past 30 years. Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Many Wyoming communities depend on the mineral industry for much of their economic well being. The assessed valuation on total minerals produced in 1996, just over $4 billion (WDAI 1999), accounted for more than 50% of the state's total assessed valuation (WDR 1999a). The mineral industry is a significant revenue base for both local and state government in Wyoming (WDR 1997).

Coal production in the PRB is projected to total 363.1 million tons in 2004 (WDAI 1999). By 2005, annual coal production is projected to generate about $2.6 billion of total economic activity, including $351 million of personal income, and will support the equivalent of nearly 15,885 full-time positions (USDI, BLM 1996a). CBM production is expected to contribute nearly $1.6 billion (constant 1998 dollars) in sales over the life of the wells to the local, state, regional, and national economies.

The local counties are accustomed to absorbing fluctuations in mineral development activities which cause cycles of increasing and decreasing demands for workers, housing, and community services. The demands for qualified local workers and housing may be met by the counties. An influx of new residents into the local counties to meet the combined workforce requirements for energy development, coal mining, and power plant construction (proposed Two Elk power plant) could exhaust the available supply of temporary or permanent housing in the counties. This could result in new house construction.

REGULATORY COMPLIANCE, MITIGATION, AND MONITORING

In the case of surface coal mining, SMCRA and state law require a considerable amount of mitigation and monitoring. Measures that are required by regulation are considered to be part of the Proposed Action and alternatives. These requirements, mitigation plans, and monitoring plans are in place for the No Action Alternative as

part of the current approved mining and reclamation plan for the existing Buckskin Mine. If the proposed lease exchange is completed, these requirements, mitigation plans, and monitoring plans would be part of a mining and reclamation plan revision covering the proposed lease exchange tract. This mining and reclamation plan revision would have to be approved before mining could occur on the tract regardless of who acquires the tract. The major mitigation measures and monitoring measures that are required by state or federal regulation are described in table 4-6.

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

TABLE 4-6
REGULATORY COMPLIANCE, MITIGATION, AND MONITORING REQUIRED UNDER THE PROPOSED ACTION AND NO ACTION ALTERNATIVES

Resource	Regulatory Compliance or Mitigation Required by Stipulations , State, or Federal Law[1]	Monitoring
Air Quality	Dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air; using particulate pollution control technologies; using work practices designed to minimize fugitive particulate emissions; using EPA- or state-mandated BACT, including: fabric filtration or wet scrubbing of coal storage silo and conveyor vents; watering or using chemical dust suppression on haul roads and exposed soils; containment of truck dumps and primary crushers; covering conveyors; prompt revegetation of exposed soils	On-site air quality monitoring for PM_{10} or TSP; off-site ambient monitoring for PM_{10} or TSP; on-site compliance inspections.
Alluvial Valley Floors	Identifying all AVFs that would be affected by mining; Determining significance to agriculture of all identified AVFs affected by mining (WDEQ); Protecting downstream AVFs during mining; Restoring essential hydrologic function of all AVFs affected by mining.	
Cultural Resources	Conducting Class I and III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings; Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP; Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan; Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations; Instructing employees of the importance of and regulatory obligations to protect cultural resources	Monitoring mining activities by archeologist qualified by appropriate federal or state agency.
Geology and Minerals	Identifying and selectively placing or mixing chemically or physically unsuitable overburden materials to minimize adverse effects to vegetation or groundwater.	
Groundwater Quality	Evaluating cumulative impacts to water quantity associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity; Restoring recharge capacity of the reclaimed lands to support postmining land use.	Monitoring wells track water levels in overburden, coal, interburden, underburden, and backfill.

Resource	Regulatory Compliance or Mitigation Required by Stipulations , State, or Federal Law[1]	Monitoring
Hazardous and Solid Wastes	Disposing of solid waste and sewage within permit boundaries according to approved plans; Storing and recycling waste oil; Maintaining files containing material safety data sheets for all chemicals, compounds, and/or substances used during course of mining; Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable federal, state, and government requirements; Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended; Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; Preparing emergency response plans;	
Land Use	Suitably restoring reclaimed area for historic uses (grazing and wildlife).	
Native American Concerns	Notifying Native American tribes with known interest in the area of leasing action and asking for help in identifying potentially significant religious or cultural sites.	
Noise	Protecting employees from hearing loss.	MSHA inspections.
Paleontological Resources	Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining.	
Socioeconomics	Paying royalty and taxes as required by federal, state, and local regulations.	
Soils	Salvaging soil suitable to support plant growth for use in reclamation; Protecting soil stockpiles from disturbance and erosional influences; Selectively placing at least four feet of suitable overburden on the graded spoil surface below replaced topsoil to meet guidelines for vegetation root zones.	Monitoring vegetation growth on reclaimed areas to determine need for soil amendments.
Surface Water	Building and maintaining sediment control ponds or other devices during mining; Restoring approximate original drainage patterns, stock ponds, and playas during reclamation.	Monitoring storage capacity in sediment ponds; Monitoring surface water quality and quantity.
T&E and Candidate Species	Avoiding bald eagle disturbance; restoring bald eagle foraging areas disturbed by mining; Surveying for mountain plover; restoring mountain plover habitat disturbed by mining; Using raptor-safe power lines; Surveying for Ute ladies' tresses; Searching for black-footed ferrets if prairie dogs move onto tract.	Baseline and annual wildlife monitoring surveys.

Resource	Regulatory Compliance or Mitigation Required by Stipulations , State, or Federal Law[1]	Monitoring
Topography and Physiography	Restoring to approximate original contour or other approved topographic configuration, including providing rock piles, shrub mosaics, and stable channels designed to give a natural appearance.	
Transportation Facilities	Relocating existing pipeline, if necessary, in accordance to specific agreement between pipeline owner and coal lessee.	
Vegetation	Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominately of species native to the area; Reclaiming 20% of reclaimed area with native shrubs at a density of one per square meter; Controlling erosion on reclaimed lands before seeding with final seed mixture using mulching, cover crops, or other approved measures; Chemically and mechanically controlling weed infestation; Direct hauling of topsoil; Selectively planting shrubs in riparian areas; Planting sagebrush; Creating depressions and rock piles; Using special planting procedures around rock piles; Posting reclamation bond covering the cost of reclamation.	Monitoring revegetation growth and diversity until release of final reclamation bond (minimum 10 years).
Visual Resources	Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species.	
Wetlands	Identifying all wetlands that would be affected by mining; Identifying jurisdictional wetlands (COE); Replacing all jurisdictional wetlands that would be disturbed by mining; Replacing functional wetlands as required by surface managing agency or surface landowner.	

Resource	Regulatory Compliance or Mitigation Required by Stipulations , State, or Federal Law[1]	Monitoring
Wildlife	Restoring premining topography to the maximum extent possible; Planting a diverse mixture of grasses, forbs and shrubs in configurations beneficial to wildlife; Designing fences to permit wildlife passage; Raptor-proofing power transmission poles; Creating artificial raptor next sites; Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land; Cottonwood plantings along reclaimed drainages; Replacing drainages, wetlands and alluvial valley floors disturbed by mining; Reducing vehicle speed limits to minimize mortality; Instructing employees not to harass or disturb wildlife; Preparing raptor mitigation plans	Baseline and annual wildlife monitoring surveys; Monitoring for MBHFI.

[1]These requirements, mitigation plans, and monitoring plans are in place for the existing Buckskin Mine in their current approved mining and reclamation plan. If the proposed lease exchange tract is mined as part of the Buckskin Mine in the future, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision that would be approved before mining could occur.